THE GWEMBE VALLEY

A STUDY OF LOCAL RESOURCE MOBILISATION IN ZAMBIA

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CONTENTS

Page

List of Figures

List of Tables

Abbreviations and Acronyms

A N C	-	African National Congress
B S A Co.	-	British South Africa Company
C A P C O	-	Central African Power Corporation
C S O	-	Central Statistical Office
F A O	-	Food and Agriculture Organisation (of the United Nations)
G B S	-	Gwembe Building Society
G D I	-	German Development Institute
G D N	-	Gwembe District Notebook
G E M	-	Gossner Evangelical Mission
G R Z	-	Government of the Republic of Zambia
G S D P	-	Gwembe South Development Project
G V S P	-	Gwembe Valley Self-Help Promotion Society
H E	-	Hydro-Electric
H Y V	-	High Yielding Varieties
I D A	-	Institute of Development Anthropology
I R D P	-	Integrated Rural Development Programme
I D Z	-	Intensive Development Zones
I R R I	-	International Rice Research Institute
K H E S	-	Kariba Hydro-Electric Scheme
L I N T C O	-	Lint Company of Zambia Limited
M A W D	-	Ministry of Agriculture and Water Development
N A M Board	-	National Agricultural Marketing Board
O D A	-	(British) Overseas Development Administration
R L	-	Reservoir Level
R D C	-	Rural Development Corporation
S N D P	-	Second National Development Plan
S P C M U	-	Southern Province Co-operative Marketing Union
T V A	-	Tennessee Valley Authority

U D I	-	Unilateral Declaration of Independence
U N D P	-	United Nations Development Programme
U N I P	-	United National Independence Party
U N Z A	-	University of Zambia
Z V A	-	Zambezi Valley Authority
Z E S C O	-	Zambia Electricity Supply Corporation
Z A M H O R T	-	Zambia Horticultural Products Limited
Z A P U	-	Zimbabwe African People's Union

Notes on Units of Measurements and Currency Conversion

In this thesis, all the measurements are in metric units. Where necessary, [illegible] conversions are indicated. However, in instances where secondary data is used, approximate metric conversions are shown.

All the monetary units are in Zambian Kwacha (100 Ngwee = 1 Kwacha). The exchange rate of one Kwacha into one Pound (Sterling) in the period where financing is discussed is as follows:-

1971		1.71
1972	December	1.679
1973	September	1.55
1974	October	1.503
1976	April	1.2018
1977	April	1.360
1978	April	1.548
1979	April	1.665
1980	April	1.7145
1981	April	1.867
1982	March	1.6525
1983	March	1.761
1984	March	2.295

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ABSTRACT

This thesis traces the Gwembe Tonga's socio-economic background in the recorded history. And it also attempts to understand their indigenous agronomic system. It reveals that a change in either of the two variables compels a corresponding adaptation by the other.

A case study on the Lake Kariba Resettlement Programme in Gwembe Valley, in Zambia, is shown to have ignored the local indigenous agronomic systems. Nevertheless, the resettled people are shown to have devised their own ways of adapting their indigenous agronomic system onto the new environment. The limitations arise mainly due to a lack of coordination between the cultivator and the lake regulating agency. A hypothetical paradigm which integrates the local people's use of the new environment with the lake fluctuations is constructed and tested. Indeed, its exploitation is shown to require an appropriate institutional framework.

The existing planning and administrative apparatus in Gwembe Valley and, indeed, even the experiences in rural development in other areas of Zambia, are shown not to be necessarily adequate for Gwembe Valley development. The micro projects promoted by an evangelical mission in Gwembe Valley itself are shown to be much more appropriate in as far as the technological capacity of the Gwembe people is concerned.

The thesis thus concludes that each particular region should be treated on its own merit.

Declaration

I hereby declare that this thesis has been composed by myself, based on my own research.

Preface

This thesis is based on two field-works carried out in 1983 (April to September) and 1984 (June to September). However, the first was not really concerned with the area later studied, though the focus of attention is almost similar. Before going out for field-work in 1983, I had prepared myself to conduct research on the western end of the Lower Kafue Basin in Zambia. The main thrust of the exercise was to study the impact of the fluctuation cycles of the Kafue Dam reservoir on the agricultural activities of the people of Namwala District.

However, when I arrived in Zambia, I was requested by the Ministry of Agriculture and Water Development to change my study area from Kafue to Lake Kariba Basin, so as to evaluate the activities of the Gwembe South Development Project (G.S.D.P.), a resettlement component. The argument was that, due to the prevalent drought, the Gwembe Valley was a priority area, but, before designing intervention measures, there was a need to gather the experiences that the G.S.D.P. had had with small-holder irrigation. With the approval of my supervisor, Harold Dickinson then, I landed on the Gwembe Valley. Thus, the initial research exercise departed from the usual trend of having an already conceived schema of research programme.

Dr. Per Eklund of the Ministry of Agriculture and Water Development and Professor Geofrey J. Williams of the Kafue Basin Research Committee (Geography Department) kindly served as my local supervisors. Despite my limited knowledge of the area, they encouraged me to just go out to observe and collect as much material and data as I could. Due to the concentration of the G.S.D.P. activities in Gwembe South Region, it has also become the main area of attention in this thesis.

In Gwembe Valley, I was stationed at the Gossner Evangelical Mission camp at Sinazeze. The association with the G.S.D.P. staff members enabled me to be well-received by the farmers. Whilst I collected most of the statistical data from the project files kept by the project officers, most of the material on actual agricultural practices I gathered from the discussions I had with the farmers.

I initially worked with the farmers involved in the three irrigation schemes studied, but, when the farmers abandoned the schemes due to the Lake Kariba water recess below the schemes' water pumping units, I followed them as they went to cultivate the drawdown areas. Thereafter, I started having discussions with those people who had no plots in the irrigation schemes.

When I came back to Edinburgh, I went ahead to write my evaluation of the Gwembe South Development Project (Appendix 1), and I started tracing, through the review of the pertinent literature, the Gwembe people's past use of the land and water resources. Apparently, there seems to have been very little academic interest in the Gwembe Valley before 1955, when the decision to dam the Kariba Gorge was made. In fact, the dearth of any published monographs on the area prompted the Rhodes Livingstone Institute to engage Professor Elizabeth Colson and Professor Thayer Scudder to record the sociological and ecological aspects of the area before it was inundated and people resettled in higher grounds. Their subsequent publications are largely based on the material they collected before 1960. Nevertheless, they have continued to study the Gwembe people's adaptation to the new environment (Bibliography) and they are now calling for other researchers, local (Zambian) if possible, to continue the studies on technology and social change (Colson and Scudder, 1979). However, there still does not seem to have been any study which attempts to integrate the Gwembe Valley indigenous agronomic practices with the fluctuation trends of the waters of Lake Kariba. Thus, it became necessary to undertake the second field trip so as to trace the evolution of the Gwembe Valley agrarian system as well as to collect material on the socio-economic background of the Gwembe Valley before damming (1960). The trip also offered a chance to verify the material and data collected on the first field trip.

It was also during the second field trip that other interests involved in Lake Kariba Basin resources, both in Zambia and Zimbabwe, were contacted (Appendix 2). The chance of being in Zimbabwe allowed me to learn from other experiences of smallholder irrigation, at the African Regional Symposium on Smallholder Irrigation, held in September 1984. I also discussed some of the experiences from Gwembe Valley (Appendix 3).

CHAPTER ONE

INTRODUCTION: Indigenous Agrarian Systems and Water Manipulation

A Statement of the Problem

Theoretical Perspective

From the time that studies on the agriculturally-oriented settlement schemes in Tropical Africa began to appear, especially in the period following World War II, much progress has been made in the understanding of the technological adaptive capacity of small-scale farming households. Whereas most earlier studies saw the limited technical know-how of the small-scale farmers about the introduced technologies as one of the main reasons for failure in most schemes, recent studies have rather come to counteract this myth. In fact, most discussions now emphasise the strength of the wider political economy in engulfing the 'development process' as the factor more relevant in the explanation of most adverse experiences (Mabogunje, 1980; Chambers, 1983). However, the area that has received the least attention, both academically and in practical intervention, is the small farmer's _own_ agrarian system, upon which new technology and infrastructure are being superimposed.

Some political economists have argued rather forcefully that most of the externally inspired and supported efforts at agricultural development in the smallholder sector, both in the _pre_ and _post_ independence periods, have not been specifically geared to the advancement of the agrarian system of the small farmer, nor essentially to the improvement of _his_ living conditions. Their main concern has been seen to be the enhancement of the political and economic hegemony of those in power (Barnett, 1975; Payer, 1982; Dinham and Hines, 1983). Thus the consequential deterioration of the participating farmers' living conditions and the ecological depletion of much of the environment are, unfortunately, the logical sequel (Franke and Chasin, 1980).

As an exemplification of the common experiences of most interventions, socio-economic impact studies have revealed that, in the pursuit of their objectives, the social-cultural values of the local societies involved have come to be severely compromised by the national and international pressures (Colson, 1966; Dey, 1982).

What is interesting about this discussion is that it has tended to be too preoccupied with the issue of transfer of technology - that is, with how it is diffused and adopted and not with <u>how</u> or by <u>whom</u> the new technologies are chosen, nor with their 'appropriateness' to those societies. Unfortunately, the discussion does not seem to have, in any significant way, influenced the manner in which new agricultural projects are being planned and implemented. In fact, most interventions are now being earmarked at three main areas:

i critical assessment of the new technologies to be diffused (World Bank, 1981)

ii strengthening of the implementation capacities of the concerned institutions (Chambers, 1974; Ghai, *et al*, 1979; Matango, 1979) and

iii improving the technological *adoption* capacity of the people involved (Benor and Harrison, 1977).

It is mostly expected that such careful planning should enable technologies to succeed. However, as yet, all too many of the participants continue to be only passively involved; promoters continue to be bewildered as their expectations fail to materialise; and the academics continue to document experiences and to prescribe new, often theoretical remedies.

Of late, there seems to be a new focus of attention. Instead of entirely concentrating on the new technology to be diffused and the manner of its utilisation, there is an increasing awareness of the technological adaptive capacity of the small farmer and also of the situational appropriateness of his agrarian system (Hill, 1970; Chambers, 1983; Kurin, 1983; Richards, 1983). Hence the application of an already designed 'blueprint' model for all situations has been seen wanting (Hyden, 1983).

The few studies that have attempted to document the nature of the small farmer's own agrarian systems have revealed their diversity (Nyorko, 1968; Mcloughlin, 1970; Brokensha, 1980). These reflect different ecological endowments, social cultural values, nature of external links, and so on. This multitude of factors has made the traditional agrarian systems quite situationally specific, both in time and in space.

For example, the pre-colonial agricultural system in Zimbabwe showed very clearly the power of <u>ecological influences</u>. The Highveld, with more arable land and with pleasant temperatures, was the most cherished and hence the most densely populated portion - whereas the Lowveld, with a harsh environment and less arable land, was the least cherished and thus sparsely populated (Kay, 1970), and among the Sonjo of Tanganyika (now Tanzania) we find that the <u>socio-cultural values</u> were reflected in the <u>distribution of</u> their <u>land and water</u>

resources. Gray (1963) has demonstrated that the quality of land allocated to individuals depended very much on the recipient's position in the social hierarchy. The higher one's status, the better the land allocated to him and the earlier he received his irrigation water. People at the bottom of the hierarchy were allocated the least arable land and they were [illegible] the [illegible] of the water distribution network. Franke and Chasin (1980) demonstrate the symbiotic relationships that the agriculturalists and the pastoralists developed, in the pre-colonial period, in some of the West African states. Whereas the former were more or less sedentary, the latter were nomadic, but they developed a beneficial seasonal arrangement in which, wherever they met, they would trade goods collected by the pastoralists through their wanderings, and the food produced by the settled agriculturalists. During these meetings, the animals used to be allowed to feed on the stubble-fields after the agriculturalists' harvest. In the process, the animals would replenish the soil by their 'droppings' and also by turning the soil.

However, these traditional agrarian systems were not without limitations. They suffered from the problems of human and animal land pressures, vagaries of seasonal rainfall patterns, inadequate tools, sporadic outbreaks of diseases, and the like. Nevertheless, they had, to some extent, built-in adjusting mechanisms. For example, the acclaimed tropical land use system, offered by the slash and burn techniques, depended critically on the availability of virgin (or rejuvenated) land and enough manpower resources to clear the bush for new fields. Where land became scarce, fragmentation of existing fields, and sometimes mass emigration, resulted (Gleave and White, 1972; Davidson, 1974), but in much of the colonial period some of the resources upon which the traditional agricultural system's adjusting mechanism depended came to be integrated into the demands of the wider economies. The utilisation of land and human resources clearly demonstrate this phenomenon.

In hospitable environments with the most arable land, such as the Highveld in Zimbabwe, the so-called White Highlands in Kenya and the colonial 'line of rail' areas in Zambia, land was appropriated and the original inhabitants marginalised to less arable areas, designated native reserves (Palmer, 1977; Mosely, 1983; Robertson, nd.). In areas where land was not appropriated (especially in the less arable areas), the colonial administration enacted instruments which severely limited the technological adaptive capacity of the traditional agrarian systems. The hut and toll taxes were successively the most severe, in that they transcended the regional environmental physical characteristics. Their purpose was mainly to compel the able-bodied workers to leave their homelands, and seek wage employment in the externally-oriented agricultural and mining enclaves. Since most of the traditional agrarian systems depended very much on the availability of extensive land resources and the presence of the able-bodied manpower, these developments made them very precarious.

Unfortunately, the attainment of political independence in most African states has not, in any significant way, altered this pattern. Indeed, in the pursuit of too rapid modernisation, inappropriate rural development models have been transplanted. The results have, in most cases, been very disappointing (Dumont, 1966). It is from this background that attention is now being called to look more critically at the farmers' own technological and ecological factors, in the designing of any interventions in their economic systems (Chambers, 1983; Hyden, 1983).

Smallholder Irrigation and Indigenous Technological Level

The new interest in the situational appropriateness of the traditional agrarian systems has been well received in discussions of irrigation development. Coward (1977) highlights the need to learn how recurrent technological problems used to be solved in those societies in which water resources were harnessed to produce food requirements. However, his main interest is in the adoption of some of the traditional organisational methods in the running of the modern irrigation systems; and, from an overview of some of the small-scale irrigation schemes in Tropical Africa, Barnett (1984) emphasises the now-popular prescription that irrigation development plans should be based on the farmers' own existing technological level, but Barnett's study lacked intensity as it was not based on new empirical evidence but rather on secondary data (ibid). Nevertheless, his prescription forms the major theme of the latest Food and Agricultural Organisation document on smallholder irrigation development (Underhill, 1984); and it also came to be the main area of discussion at the African Regional Symposium on Smallholder Irrigation which was held in Harare in September 1984 (Blackie, 1984). In spite of these developments, the literature still lacks an adequate discussion of how a traditional land and water use system (irrigation) could be either improved or integrated into the modern manipulation of water resources.

Man-Made Lakes and Resettlement Impacts

In the past three decades, most of the major African rivers have been dammed. Since most of the dams, with the exception of the Aswan High Dam, were designed for the sole purpose of hydro electricity generation, the resettlement of the people whose land has been flooded has caused a great deal of controversy. The discussions have centred on two main issues. The first argument is that, because of the inadequate planning that preceded the resettlement episode, the people involved have been adversely affected (Chambers, 1970); and the second argument is that the chance of transforming the traditional agrarian system, offered by the lake formation, has largely been lost (Scudder, 1980).

However, empirical evidence at hand, based on the Lake Kariba Basin, on the socio-economic history of the area spanning a period of over 60 years before dam construction, and the recent observations of Gwembe Valley people's response to the behaviour of the Lake Kariba (that is fluctuations in its level), supported by extensive hydro-engineering literature, does seem to suggest that the experiences in this area do not necessarily fit these generalised conclusions. I will argue, in this thesis, that, at the time of the Kariba Dam construction, the Gwembe Valley agrarian system was already in a process of change, as it had by then lost much of its original vitality; and I will demonstrate that the traditional Gwembe Valley land and water use (irrigation) could still be integrated into the regulation of Lake Kariba. Indeed, an evaluation of the 'conventional' smallholder irrigation will show the people's flexibility in appreciating different ecological endowments both in space and in time. I am, thus, arguing that the chance of transforming the traditional agrarian system has not <u>necessarily</u> been lost.

This discussion challenges the existing paradigms on river basin development in Tropical Africa. It calls for a new perspective, not only on how some of them presently operate, but also on how they could be adjusted to enhance the technological capability of the small farmer. In the effort to emphasise the situational appropriateness of some of the indigenous Tropical African agrarian systems, I will demonstrate how areas of intervention could be identified and appropriate actions designed. These will be my main objectives.

Originality of the Study

There are four main reasons why the Lake Kariba Basin qualifies for this type of study:

1. It is one of the Tropical African large-scale hydrology projects.

2. It has accumulated enough operational experience and statistical data.

3. Its resettlement programme is one of the most extensively studied (Colson and Scudder, 1979).

4. In spite of the dam construction, the region is still one of the least developed parts of both Zambia and Zimbabwe (Scudder, 1982).

My interest in studying the problems of local resource mobilisation in the Lake Kariba Basin arose from the task assigned to me, in 1983, by the Zambian Government, Ministry of Agriculture and Water Development, to carry out a socio-economic evaluation of the Gwembe South Development Project, a resettlement component (Appendix 1). I discovered, during this exercise, that the main activity of the project - promotion of smallholder irrigation - was not as successful as expected by the initiators; but, whilst the project promoters and managers were bewildered by the problems of water pumping, due to the lowering of the lake level much below the water intake points, both the collaborating farmers and those outside the scheme were busy cultivating their food crops following the Lake Kariba water recession.

It then occurred to me that maybe it would be better to go further and study the people's response, both to the pilot irrigation schemes and their appreciation and utilisation of the moist land resource set free by the receding waters. Thus it became necessary to look at the pre-damming land and water use systems. It was then that I realised that the recent people's use of the Lake Kariba shoreline was an adaptation of their long-evolved agrarian system, which had been disturbed by the formation of the Lake Kariba. From this basis, I have made an attempt, supported by hydro-engineering literature, to suggest how to integrate the Gwembe Tonga traditional agrarian system to the regulation of Lake Kariba.

Thesis Outline

In chapter two, the geographical characteristics of the Lake Kariba Basin are discussed. The main concern is with those factors which have had a profound effect on the Gwembe Valley traditional agrarian system. In the third chapter, I discuss the impact of the socio-economic and political issues on the Gwembe Valley. The attention is mostly focussed on the first half of this century, that is before damming. Nevertheless, the discussion is extended to cover the experiences in the resettlement programme in the post-damming and Zambian independence period.

In chapter four, an attempt is made to reconstruct the indigenous agrarian system of the Gwembe Valley. An assessment of how this system coped with the demands on it is then made.

The evaluation of the pilot irrigation schemes which were promoted as part of the resettlement programme is made in chapter five. This is a case study based on the activities of the Gwembe South Development

Project.

In chapter six, I will suggest a hypothetical model by which the traditional agrarian system can be integrated into the regulation of the Lake Kariba water levels. The institutional implications of Gwembe Valley development are made in chapter seven. In this discussion, a comparison is made between the model used in Gwembe South which has resulted in the building of local non-governmental institutions and the one pushed by the Ministry of Agriculture and Water Development which focuses mainly on the strengthening of the implementing capacities of the existing government institutions.

In the last chapter, the salient lessons and conclusions of all the preceding chapters are summarised.

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CHAPTER TWO

Physical Setting

Constraints and Limited Opportunities

Introduction

In delineating our study area and its component parts, we shall need to revise the framework and the nomenclature of Colson (1960) and Scudder (1962). This has been seen imperative because of the environmental and political changes in subsequent years which have made the classifications of the earlier periods inappropriate, but, before we settle on our study area, we shall need to have a broad view of the locality, both as it stands along the whole length of the Zambezi river and also as it stands in the Lake Kariba Basin.

The Zambezi River Basin

The Zambezi River Basin is usually dissected into three parts based on altitudinal measurements. These are:

i The Upper River Region, that is the area from the source of the river, at latitude 11°S and longitude 24°E, and an approximate altitude of 1,457 metres (4780.18 feet) above sea level (A.S.L.), down to the Victoria Falls at latitude $17^{\circ}56'$S and longitude $25^{\circ}51'$E and an altitude of 907.38 metres (2,977 feet) A.S.L.

ii The Middle River Region, lying from the bottom of the falls to the confluence of the Zambezi and Kafue rivers at latitude $17^{\circ}55'$S and longitude $28^{\circ}53'$E and at an altitude of 370.63 metres (1,216 feet) A.S.L.

iii The Lower River Region, up to the debouchment of the river into the Indian Ocean.

The cross-section of the length of the Zambezi River Basin is shown on Figure 2:1. The total catchment area of the basin has been calculated to be approximately 650,000 square kilometres (Bolton, 1984).

The study area lies wholly within the Middle Zambezi River region, stretching from the Devil's Gorge at latitude 17°58'S and longitude 27°00'E, to the Kariba Dam at latitude 16°30'S and longitude 28°48'E, as shown on Figure 2:1.

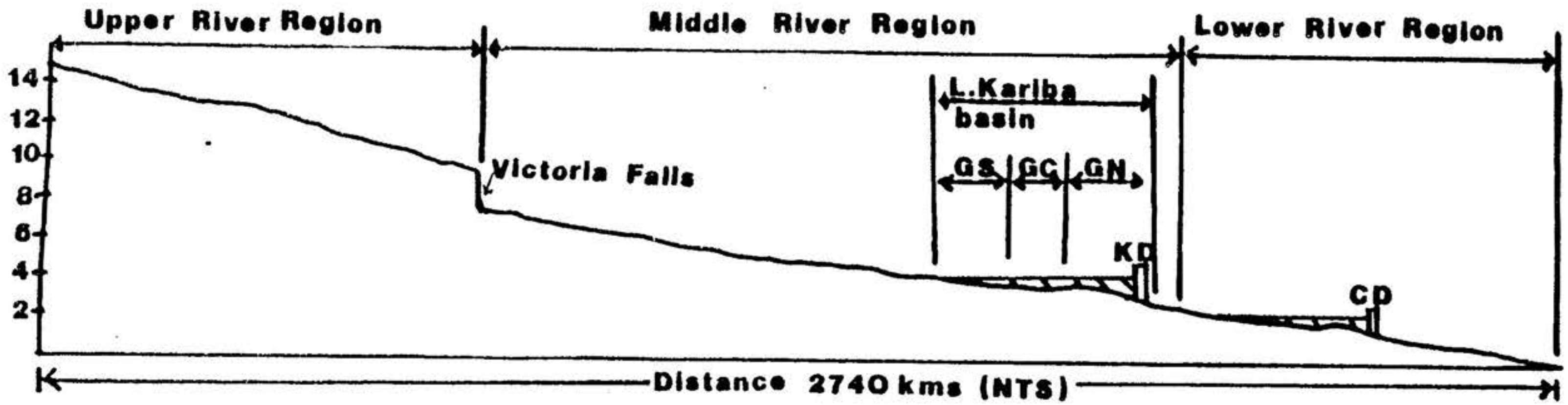
The Lake Kariba Basin

Before the formation of the Lake Kariba, Colson (1960) and Scudder (1962) described the basin as falling into two characteristic parts, based on the length of the river and the breadth of the valley. The latter was seen to be ecologically defined as the Zambezi Plain and the region of the hills. The latter included the country of the escarpments, the high upland valleys, and the area within the lower hills, but, because of the limited ecological differences in the plain, they emphasised the characteristics based on the length of the river.

In this classification, they divided the valley into three regions, as shown on Figure 2:1. The Upper River region extended from the mouth of the Gwaai River to Chete Gorge, the Middle River region lay between the Chete Gorge and a point near Kota Kota Hill, and the Lower River region extended from there through the Kariba Gorge up to the confluence of the Zambezi and Kafue Rivers.

However, with the creation of the Lake Kariba, and the conse-

Fig. 2: 1 Cross-section of the Zambezi River Regions



NOTES:

G.S	Gwembe South
G.C	Gwembe Central
G.N	Gwembe North
K.D	Kariba Dam
C.D	Cabora Bassa Dam

quential inundation of the whole riverine zone from the Devil's Gorge up to the Kariba Gorge, there was a need to redefine the lake basin area.

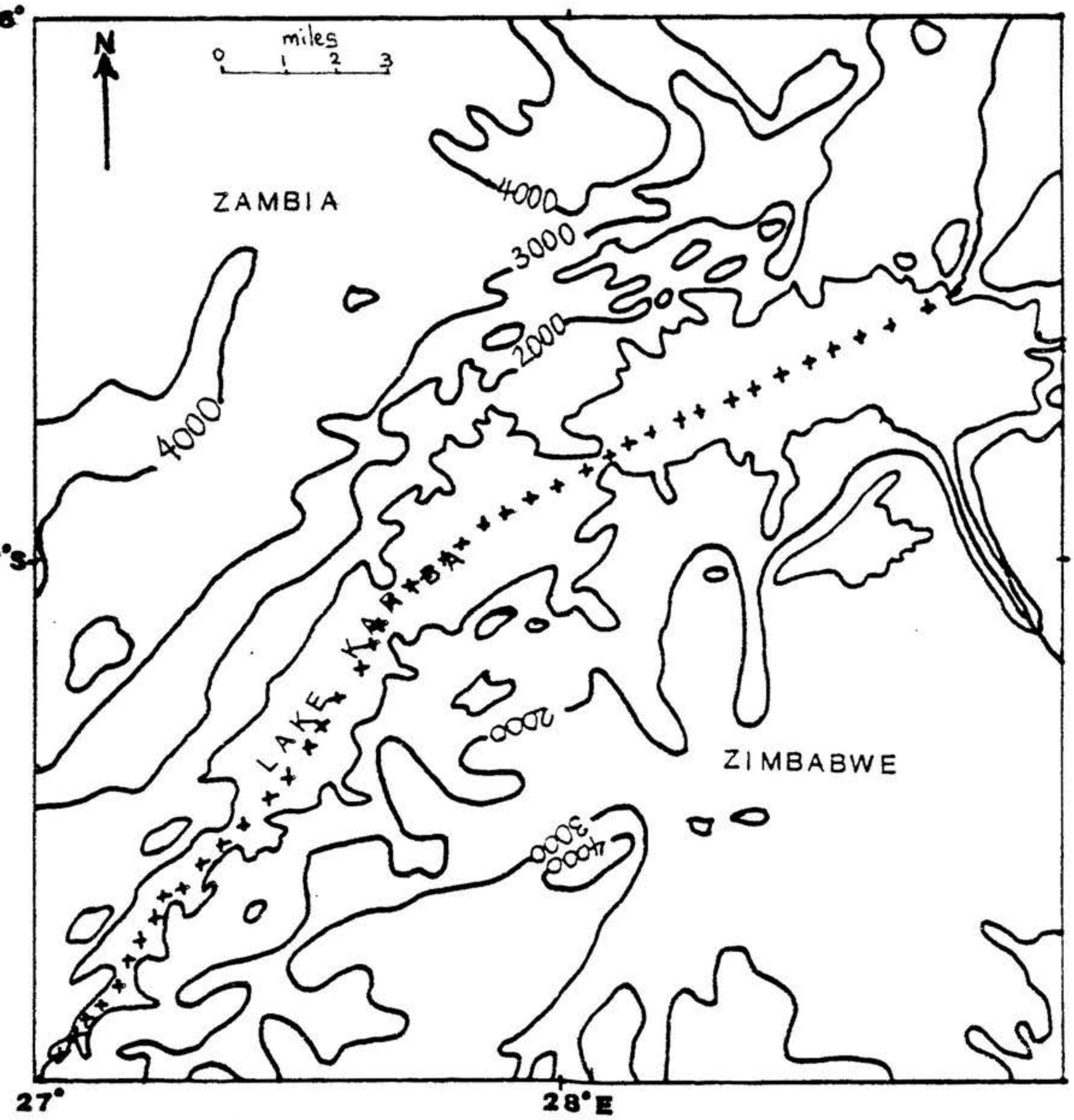
The Lake Kariba basin lies within the latitudes 16° and 18°S and longitudes 27° and 29°E. Its axis from north to south and also east to west is 212 kilometres (131.7 miles). Thus, it covers an approximate area of 44,942 square kilometres (17344.89 square miles). This is approximately 6 per cent of the whole surface of Zambia and 11 per cent of Zimbabwe.

The basin is bounded to the north by the Zambezi escarpment, trending north-eastwards. The escarpment rises from the Batoka Gorge at the south-westerly edge of the basin and runs almost parallel to the lake, up to the north-easterly edge where it comes down to the Zambezi River. Across the river, on the Zimbabwean side, the escarpment comes down in a south-westerly direction to form the northern edge of the Central Zimbabwe Plateau. It slopes towards the River Gwaai, which marks the south-westerly edge of the basin. The relief features of the Lake Kariba basin are shown on Figure 2:2.

The floor of the Lake Kariba Basin, [illegible] called Gwembe Valley in Zambia and Sebungwe Region in Zimbabwe, comprises an area some 370 kilometres (230 miles) long and varying from 160 to 240 kilometres (100 to 150 miles) in width. The basin is bisected by the Lake Kariba.

In the Gwembe Valley, much of the land surface lies between the highest expected lake level of 500 metres (1640.4 feet) A.S.L. and the foot of the escarpment at altitude 600 metres (1968.5 feet) A.S.L. Much of the land surface, of the valley floor, is not more than 15

Fig. 2: 2 Relief of the Lake Kariba Basin



1:1,500,000

+ + + + + International Boundary

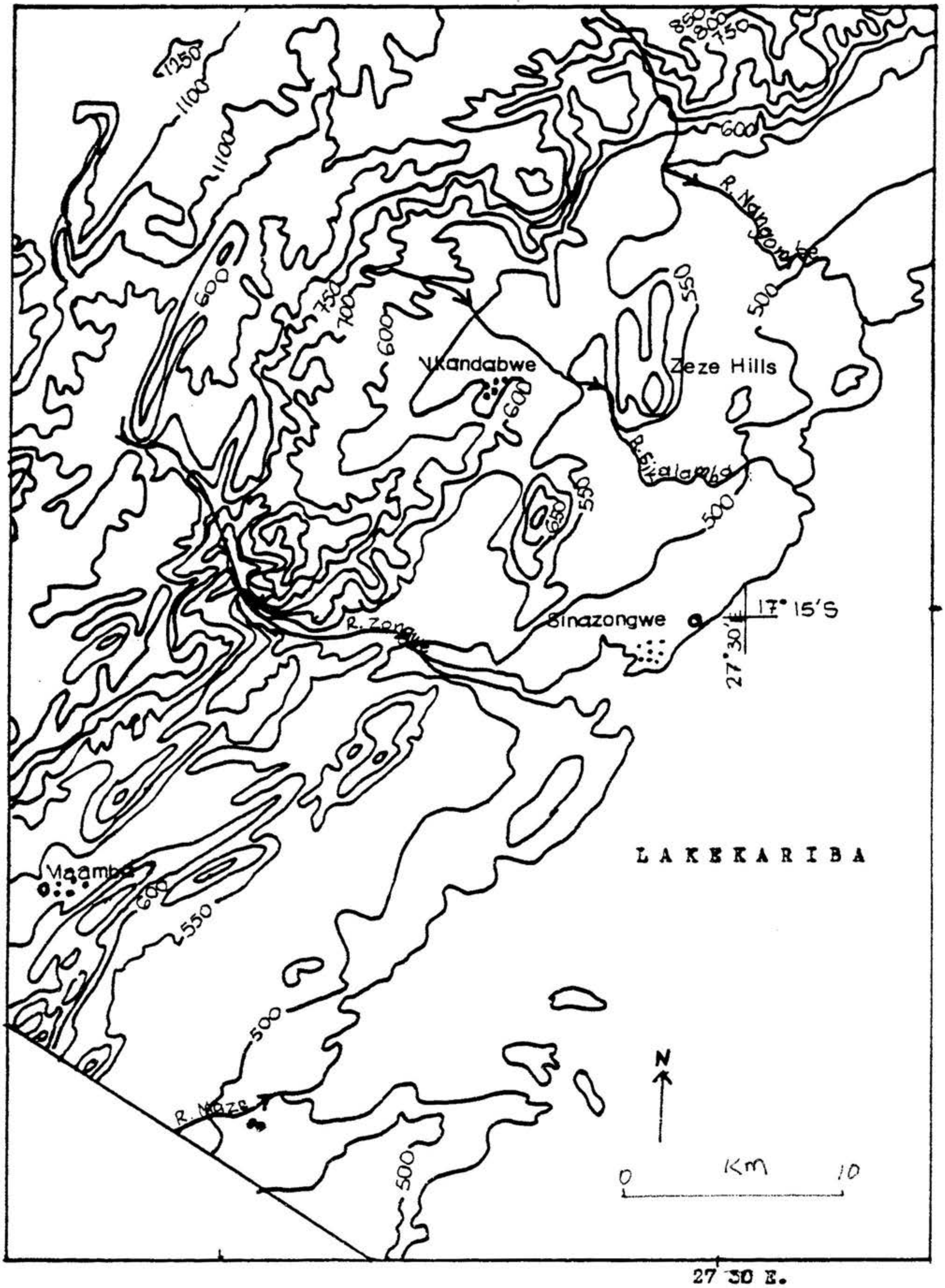
kilometres (9.3 miles) from the lake shore. The total surface area of the Zambian portion of the Lake Kariba Basin has been calculated to be approximately 30,000 square kilometres (11,583 square miles) (Bolton, 1984). This area fits the 'upland' geographical descriptions of Colson (1960) and Scudder (1962). The relief features of the Gwembe Valley are shown on Figure 2:3.

The Sebungwe Region lies within the North Lowveld region. This is land below 915 metres (3,000 feet) in altitude. The region is bounded to the east by the Zambezi 'escarpment zone', to the south and south-west by the Middle Veld, land between 915 and 1,220 metres (3,000-4,000 feet) in altitude. Figure 2:4 shows the veld characteristics in the topography of Zimbabwe. Kay (1970) describes the Sebungwe Region as being traversed by a series of escarpments and he sees the lake shore as being hemmed in by prominent hills.

And the Lake Kariba is a man-made lake which acts as a reservoir for hydro electric power generation at Kariba Dam. The lake is approximately 281 kilometres (175 miles) in length, and it has a maximum width of approximately 32 kilometres (20 miles). The lake surface covers an approximate area of [illegible] square kilometres (2,050 square miles). Thus, it covers only [illegible] per cent of the total surface area of the Lake Kariba Basin.

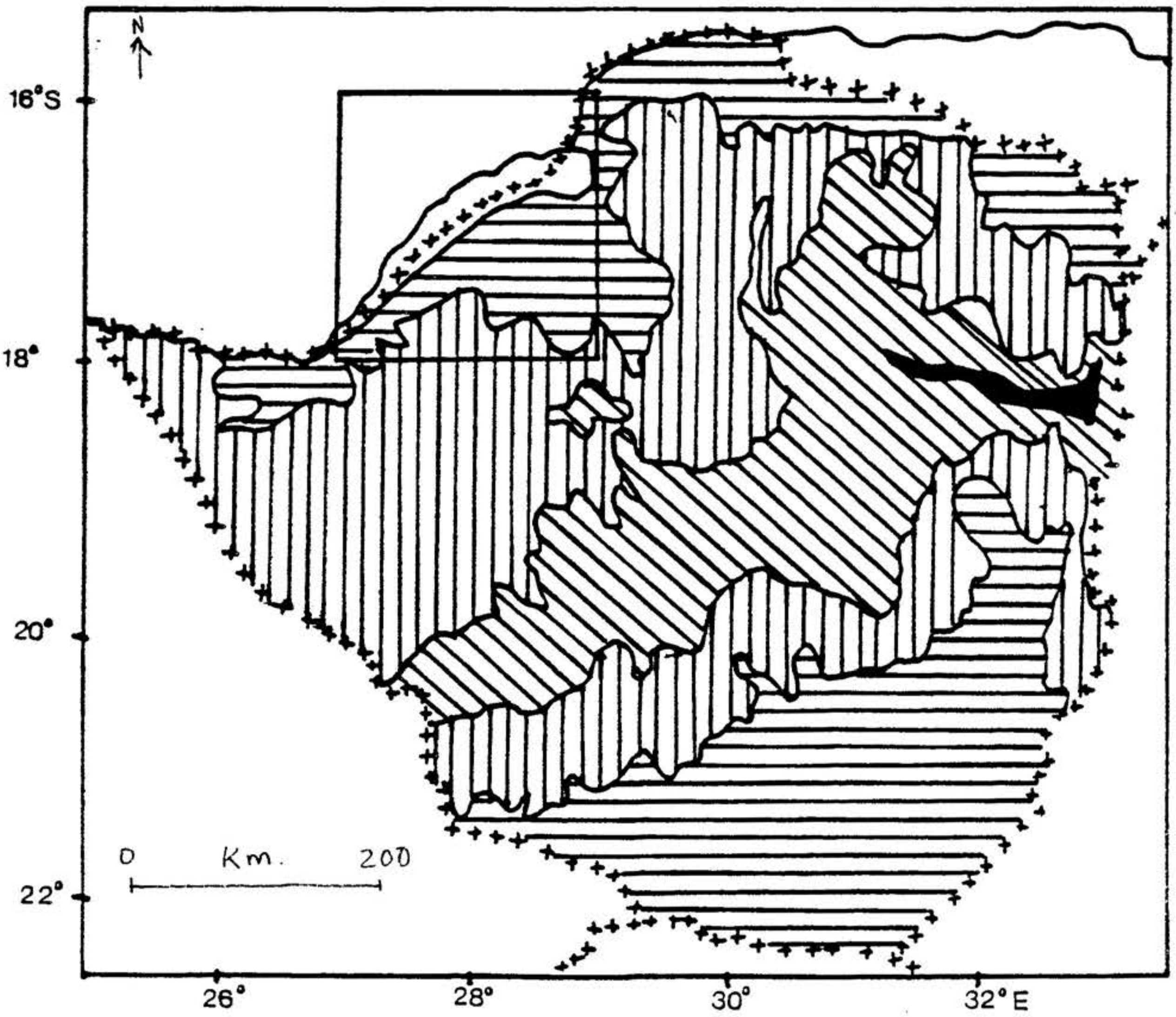
But, between the basin land surface and the lake water levels lies a tract of land normally called the drawdown zone (or the flood retreat areas). This land is usually between the lake's maximum and minimum water levels. The areal extent of the land varies with the fluctuations of the lake in each hydrological year and it also depends on the elevations in different localities along the lake shoreline.

Fig. 2: 3 Relief and Drainage of Gwembe South Region (metres)



Source: 1: 250,000 Series ZS 31 Edition 1 SE-35-7 Sinazongwe.

Fig. 2: 4 Relief Features of Zimbabwe, showing 'Veld' Distribution. Study area marked.



LEGEND

Above 5000 feet; Eastern Highlands

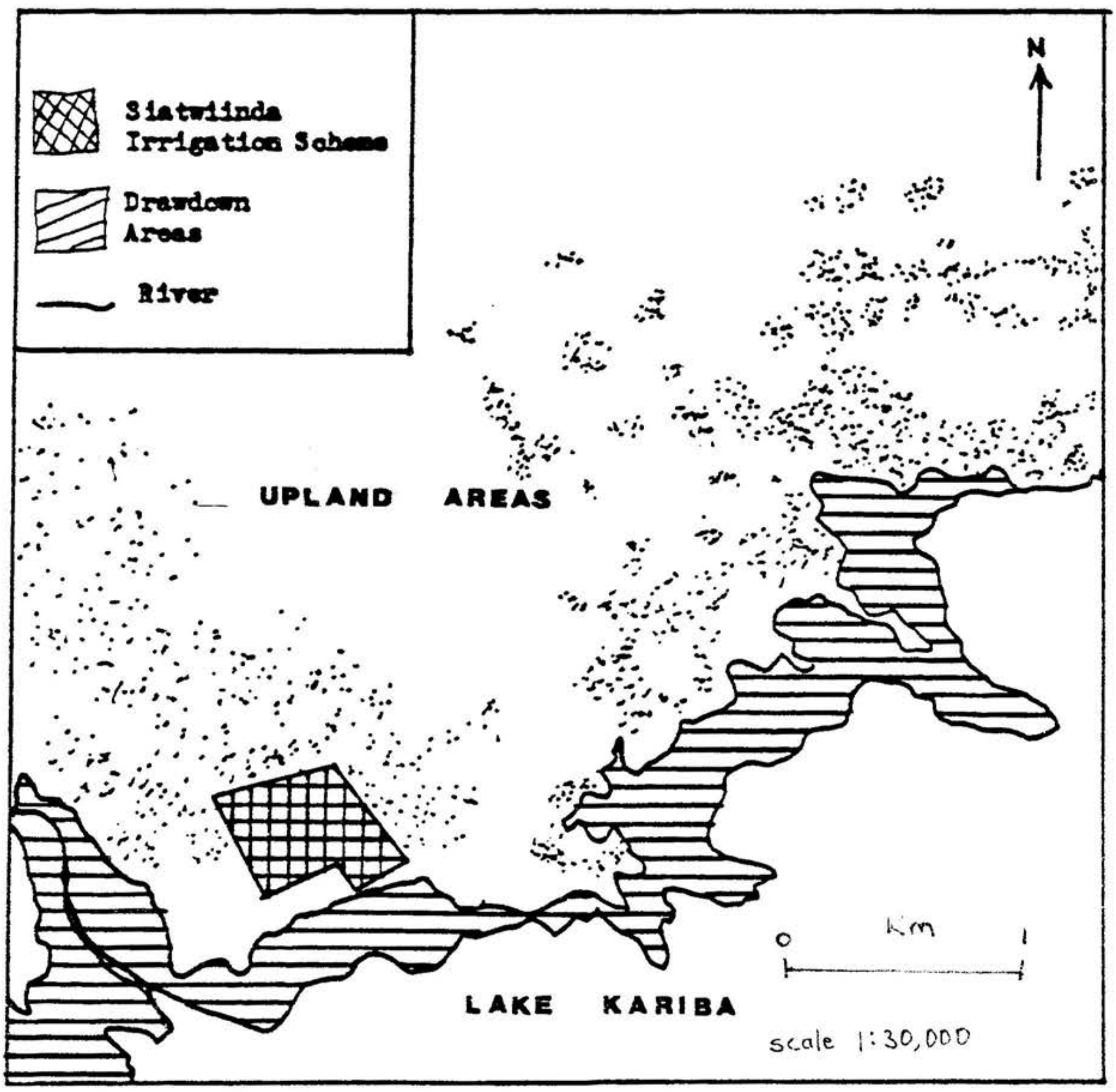
4000 to 5000 feet; High Veld

3000 to 4000 feet; Middle Veld

Below 3000 feet; Low Veld

After Kay, G. (1970), p. 14.

Fig. 2: 5 Topographical View of the Drawdown Zones, July 1980



Drawn from air photography (see Bibliography).

Figure 2:5 shows the topographical view of the drawdown zone at Siatwiinda at latitude 17°27'S and longitude 27°19'E, as in July of 1980.

Geomorphology of the Lake Kariba Basin

The physical features of the Basin are a result of geomorphological evolution, which has been traced back to the Karoo period (Wellington, 1955; Tavener-Smith, 1958; Cole, 1963; Archer, 1971). Most of these studies tend to associate the Basin formation with the East African Rift Valley System, but Wellington (1955) argues that this relationship does not necessarily explain the positioning and the course of the Zambezi River.

There is, however, general agreement that the basin's structure could have come into being through epeirogenic movement of continental significance. However, since the Karoo period, there has been extensive planation which levels off the surfaces and trims back the intervening escarpments. In certain periods, this slow reduction has been interrupted by regional uplifting and faulting, resulting in basin (or valley) structures. The continued planation process erodes the uplifted areas (escarpments) and deposits the sediments within the basin (or valley) floors.

The position of the river within the Basin and the way in which it has cut through the plateau projections, hence making the gorges which provide suitable sites for damming, have led Wellington (1955) to doubt the relationship of the river to the faulting. He rather argues that the Zambezi River could have superimposed itself on the plateau projections and that its course should be related to the Mozambique Channel below and beyond.

Soils and Agricultural Potential

The soils found in the Lake Kariba Basin are believed to derive chiefly from Karoo sediments brought to the basin through alluvial and colluvial processes (Mackel, 1971; Brammer, 1979). The soils of alluvial origin are mostly found along the rivers and they have also been traced along the Zambian Lake Kariba shoreline (Magai, 1983). Actually, the lake tends to act as a settlement ground for sediments brought down by the Lake Kariba tributaries (Bolton, 1984). Consequently, the water passing through the Kariba Dam tends to have low silt content (Guy, 1981).

Trapnell and Clothier (1957) earlier described the soils along the Middle Zambezi River and its tributaries as:

> "varying from loose, coarse loamy sands and soft micaceous sand loams to finer silty soils" (ibid, p 7).

Magai (1983) confirms the availability of soils of similar properties along the northern shoreline of Lake Kariba. These types of soils have been noted as good for agricultural purposes and are of exceptional fertility in periods of good rainfall. This is especially so in those tracts which are of recent deposition and still permeable. (Trapnell and Clothier, 1957; Philips, et al, 1962: Magai, 1983).

The colluvial types of soil are mostly found in the areas below the foot of the escarpments, in the plain. These soils are of Karoo sedimentation. They are formed out of particles eroded from the escarpment and plateau, in the continued processes of erosion and transportation. Magai (1983) identifies some colluvial soils of recent deposition in some higher slopes of the Gwembe Valley.

These soils, commonly known as Mupane, are described by Trapnell and Clothier (1957) as:

> "comprising a range from truncated gravelly soils about sandstone outcrops through light brown colluvial sandy soils to heavier clay loams, whose darker soil is masked by a light-coloured sandy surface horizon" (*ibid*, p 7).

Unlike the alluvial type soil of recent deposition, the colluvial types of soil tend to be impermeable, and the only vegetation allowed is the growing of ephemeral bush (*Copaifera mopane*). The colluvial types of soil are thus of low agricultural potential (*ibid*).

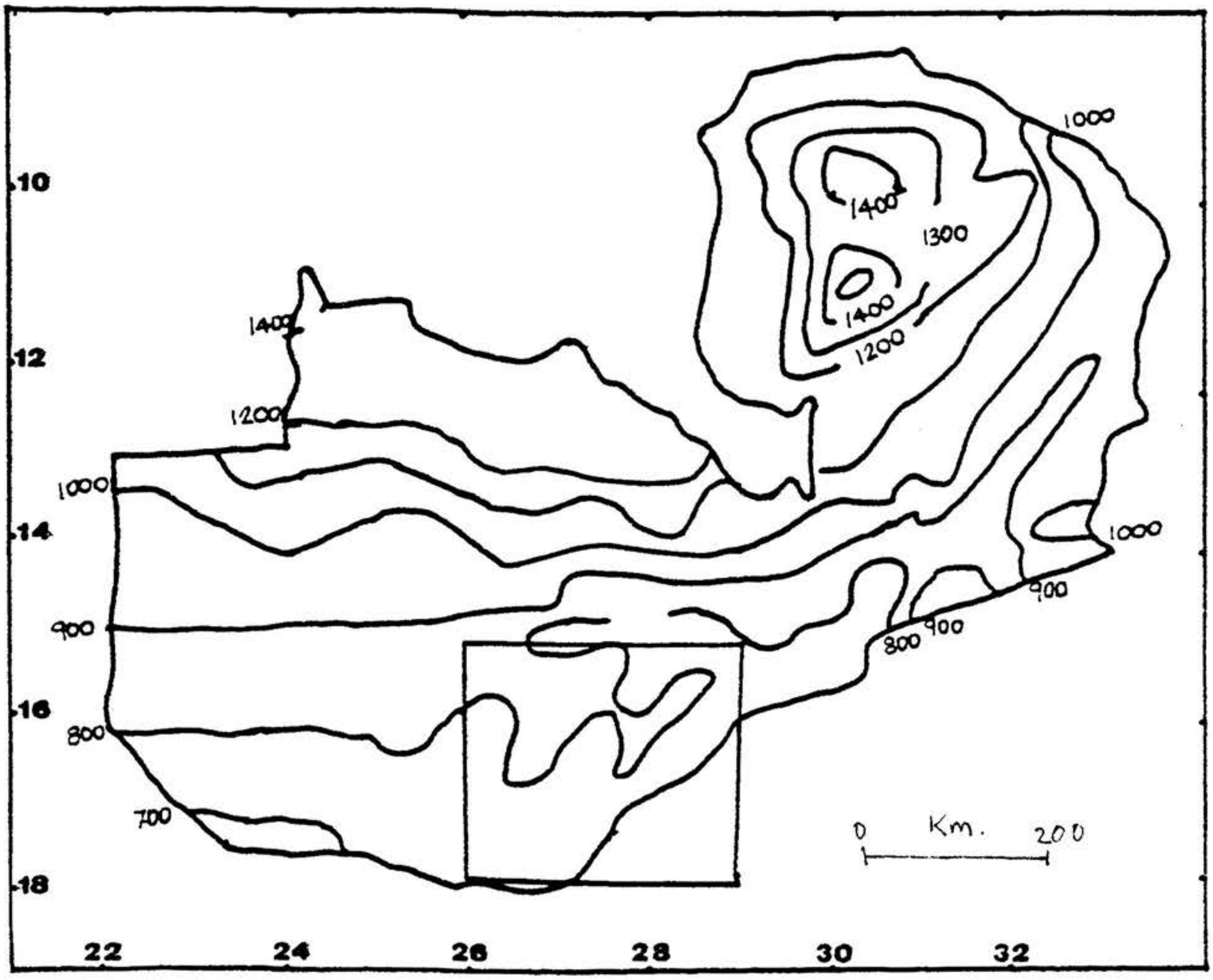
Drainage and Climatic Factors

The drainage of the Lake Kariba Basin is very much influenced by its geo-physical position and hence the climatic factors. We shall thus describe them together.

The rainfall pattern is a victim of the nature of the movement of the 'inter tropical convergence' (I.T.C.), a belt of comparatively low pressure which carries with it, in its movements, the main zones of seasonal precipitation. Both the timing of seasonal rains and the average amounts received relate to these zonal movements. Thus the northern parts of Zambia, which is incidentally the Upper Zambezi River Basin, receive more rainfall than the southern parts, in areas such as the Middle Zambezi River Basin (or the Lake Kariba Basin) (Figure 2:1). Figure 2:6 shows the distribution of rainfall totals in Zambia.

This rainfall distribution pattern is useful in the discussion of the hydrological factors of the Lake Kariba. In spite of the

Fig. 2: 6 Mean Annual Rainfall (mms.) study area marked.



Source: Hutchinson, P.(1974) The Climate of Zambia, Z.G.A., N.N.Z.A., 1974
Fig. 10, p. 21.

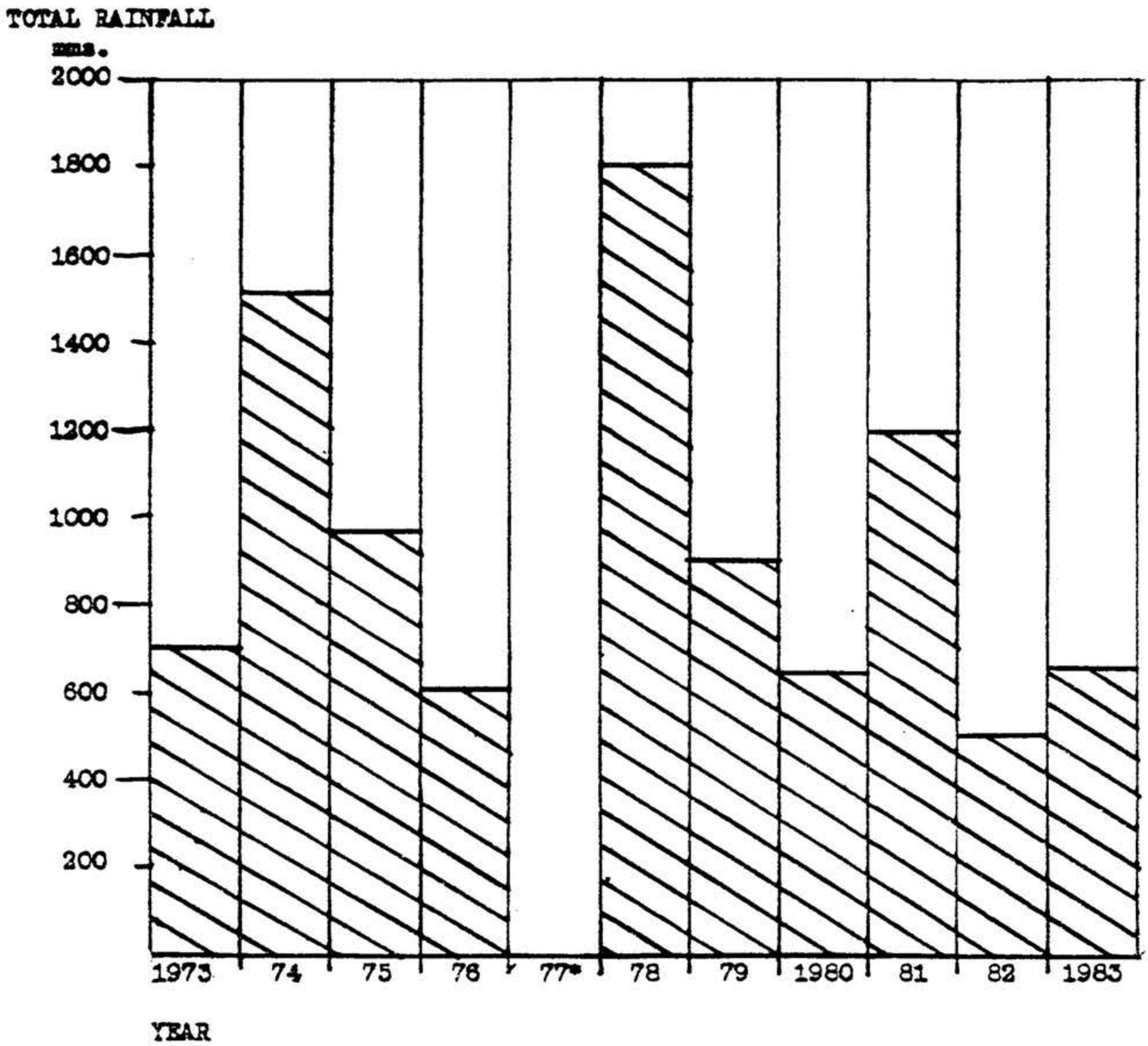
Table 2:1 Rainfall Fluctuations at Siatwiinda within and between seasons 1972/73 and 1983/84 (mm.)

Season	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total
1972-73				15	51	10	176	237	21	21			531
1973-74					81	303	477	511	100	47			1,519
1974-75					83	292	226	260	100	7			968
1975-76			2	3	8	104	49	92	292				550
1976-77			*	*	*	*	*	*	*	*			*
1977-78					57	486	275	494	390	103			1,805
1978-79				17	24	373	99	111	199	5			828
1979-80				20	52	186	46	50	265	13			632
1980-81					75	130	235	579	114	24			1,157
1981-82				2	91	43	215	78	42	3	9		483
1982-83				26	43	66	396	101	12	8			652
1983-84				8	10	296	121	*	*	*			
11-Year Average				8.27	52.27	208.09	210.45	228.45	139.54	21			

Note: * No data

Source: G.S.D.P. Monthly and Annual Reports, 1972-1984.

Fig. 2: 7 Total Rainfall at Siatwiinda, Zambia 1973 - 1983



Note: * No Data

Source: Data extracted from G.S.D.P. Annual Reports, 1973 - 83.

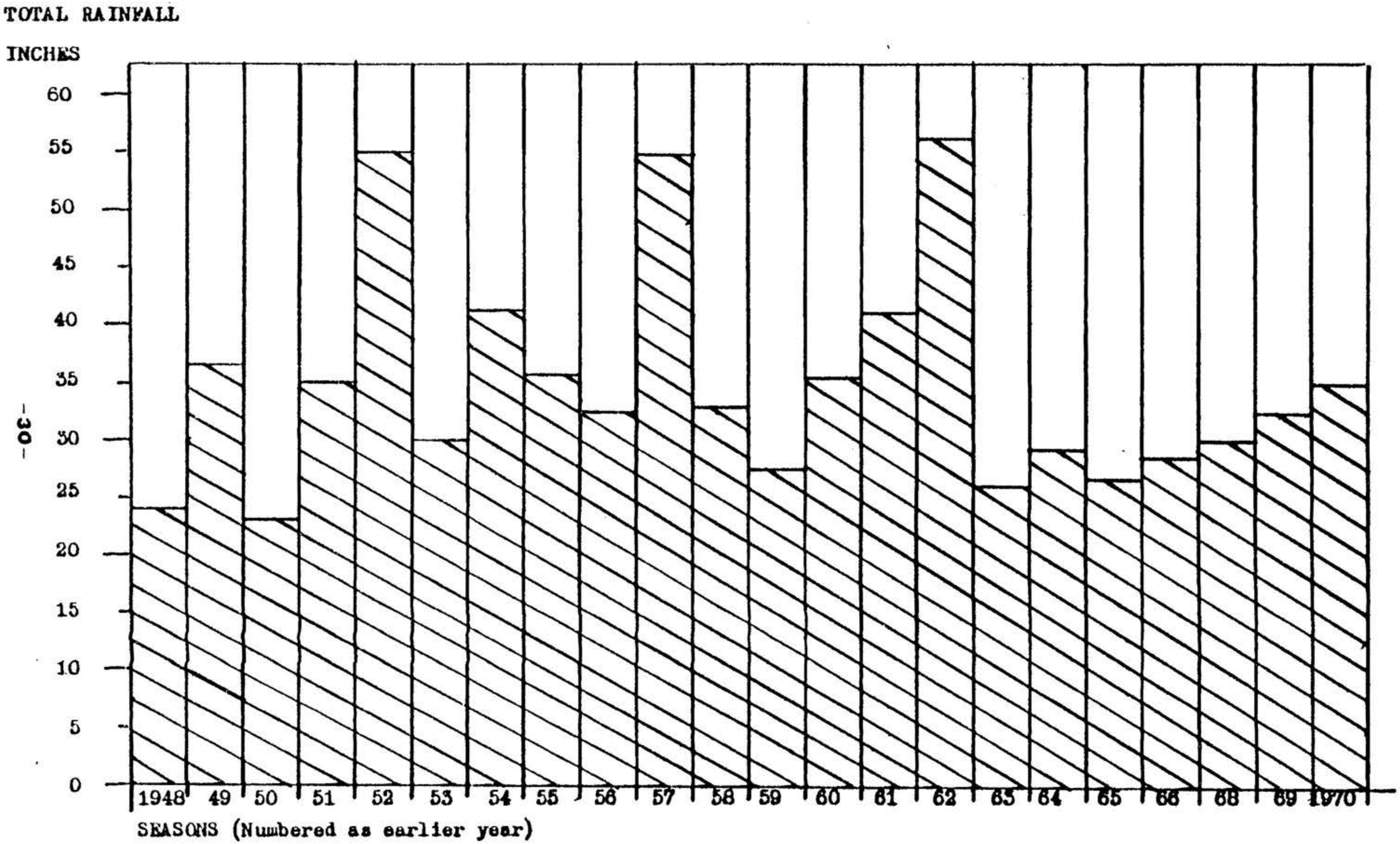
catchment area of the Lake Kariba Basin, already seen as 44,942 square kilometres, most of the water flowing into the Middle Zambezi Region, and therefore into the lake, originates not from within the Lake Basin itself but from the Upper Zambezi region; and river flow also shows appreciable annual variations. Thus so do lake levels and the water contained.

The rain in the Lake Kariba Basin falls mainly in the hot high-sun season, that is November to March. However, the annual vagaries of the I.T.C. lead to considerable annual variations in rainfall not only in timing and fluctuating annual totals, but also in spatial distribution. Table 2:1 and Figure 2:7 of rainfall characteristics at Siatwiinda, in Gwembe Valley, covering a thirteen-year period 1972/3 - 1983/4, clearly demonstrate the variations in seasonal rainfall in this area; and Figure 2.8 of the average total rainfalls collected at Gwembe Boma, on the plateau at latitude 16°30'S and longitude 27°36'E, also shows the seasonal variations of rainfall, on the escarpment, which could be of significance to the drainage of the rivers flowing into the Lake Kariba, from the Zambian side.

Though these statistical data cannot allow us to infer precise predictions of rains in the basin, they do, at least, indicate the variable nature of rainfall that the Lake Kariba Basin, and hence the Gwembe Valley, is subjected to. This has also seen to be the case in Zimbabwe on a study spanning a period of 80 years (Ngara, et al, 1983).

This rainfall characteristic results in the seasonality of the rivers draining into the Lake Kariba, with only the partial exception of the Zambezi River itself. In periods of very low rainfall, the smaller rivers just dry out. This is exacerbated by the high

Fig. 2: 8 Total Rainfall Distribution at Gwembe Boma 1948-9 to 1969-70



SOURCE: Republic of Zambia (1972) <u>Totals of Monthly and Annual Rainfall for Selected Stations in Zambia.</u> Ministry of Power, Transport and Works, Lusaka.

temperatures in the hot dry season, especially in the period from late September up to late October. Temperatures of as high as 37.7°C (100°F) have been recorded (Scudder, 1962). Consequently, the evaporation of the moisture in the top layer soils tends to be expedited (ibid).

Thus the immediate catchment area of the Lake Kariba does very little itself to augment the volume of water and hence the fluctuations of the Lake Kariba. However, Hutchinson (1973) believes that the lake's presence might have increased rainfall in the surrounding areas to some extent.

Ecological Summary

In this discussion, we have merely described the geo-physical and climatic features of the Lake Kariba Basin and the Gwembe Valley in particular. The nature of their utilisation will be subjects of our latter discussions. Nevertheless, we have attempted to highlight the environmental constraints that the area is subjected to and also the limited opportunities that it possesses; but it is only in the understanding of man's adaptation to the area that we can fully comprehend and appreciate the technology used to make the place habitable. In our next chapter, we look at man's evolution in Gwembe Valley in the recorded history. The main discussion will, however, be on the socio-economic issues pertaining to the Gwembe Valley in the first half of the 20th century. The discussion is also extended to look at some of the experiences in the Lake Kariba Resettlement Programme, in the northern shore.

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CHAPTER THREE

A History of Resource Exploitation in Gwembe Valley

Introduction

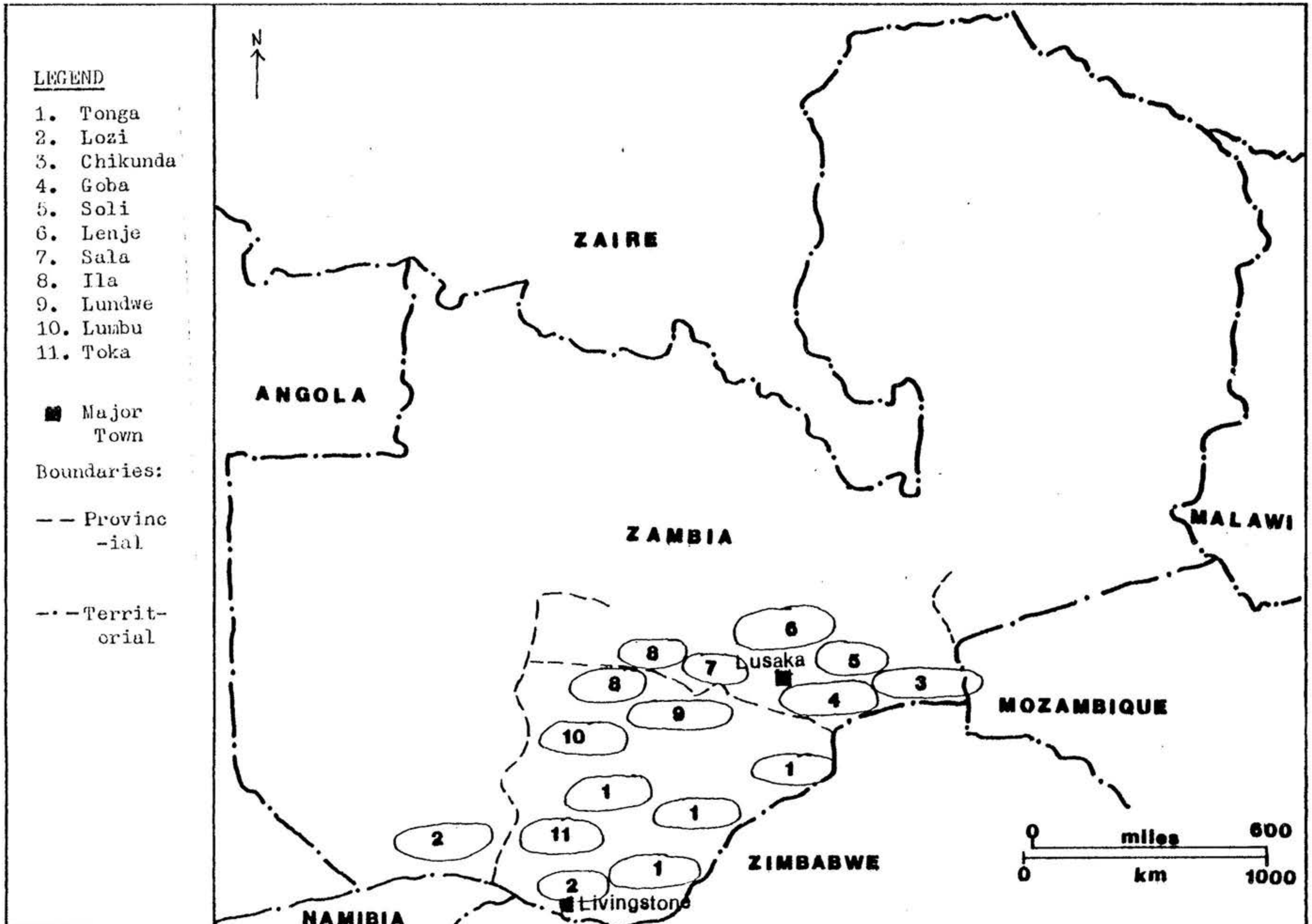
In this chapter, an attempt is being made to understand the socio-economic issues of the Gwembe Valley in an historical perspective. The focus of the discussion is upon the Gwembe South region. The major thrust of the discussion is on the Gwembe people's involvement in the economic activities that have been going on in the area from the pre-colonial to the post-independence period, and on the corresponding effects upon them. In the conclusion, the main issues underlying the type of development (or exploitive) paradigm used on the utilisation of the Gwembe Valley resources will be presented.

Social and Economic Background

The Lake Kariba Basin is a home of different tribal groupings, but the specific area of our study, Gwembe South, is occupied by people mostly referred to as the Gwembe Tonga (Brelsford, 1965). This usage is mainly intended to differentiate them from those people occupying the plateau, generally called the Plateau Tonga (Colson, 1960). Figure 3:1 shows the spatial location of tribal groupings in Southern Province of Zambia.

Macrae (1938) speculated that the Gwembe Tonga could have come to the valley in the early 19th century, but this view has now been superseded by archaelogical findings, which indicate an earlier human

Fig. 3: 1 Tribal Groups; Locations in the Southern Province of Zambia



Source: Ohannessian, S. and M.E. Kashoki (1978) Map 8.

occupation of this area even as far back as A.D. 680 $\pm$ 40 (Derricourt, 1975). Indeed, the materials found do tend to show a long-evolved cultural tradition as there does not seem to be any marked differences between those of Iron Age periods and those of more recent origins (ibid).

However, it seems to be clear from the location of most archaelogical sites (Philipson, 1972; Derricourt, 1975; Fagan, 1967) and also from the areas of human settlements in the early years of this century that the Gwembe Tonga have mostly lived their lives along the shores of the Zambezi River and its tributaries (Figure 3:2). Here they grew their main food crops, in the alluvial river deposits in winter and in the uplands in summer, but with a preference for the former cultivation areas (Trapnell and Clothier, 1957).

Apart from subsistence agriculture, the Gwembe Tonga were also involved in other economic activities which led them to be associated with some of the pre-colonial Central African Kingdoms. Fagan (1977) has demonstrated the involvement of the Gwembe Tonga in trade from the Iron Age period onwards up to the era of the trade between the East African coast and the interior. The importance of the Gwembe Valley was not so much in its provision of traded products - ivory and salt[1] - (Figure 3:3), but especially in its control of trade routes (Sutherland-Harris, 1970; Newitt, 1973; Fagan, 1977).

In a discussion of the trade between the interior of Africa and the East African coast, Newitt (1973) reveals the importance that the Zambezi River was seen to possess as a trade channel (Figure 3:4). He shows that, although some Muslim traders went up the Zambezi River, the actual trade transactions, called 'fairs', used to be organised by

1. This was unlike gold, which led to the development of kingdoms which were based at the old Zimbabwe and Mapungubwe. The sites are shown on Figure 3:3.

Fig. 3: 2 Human Settlements and Cultivation Areas along the Middle Zambesi river before damming.

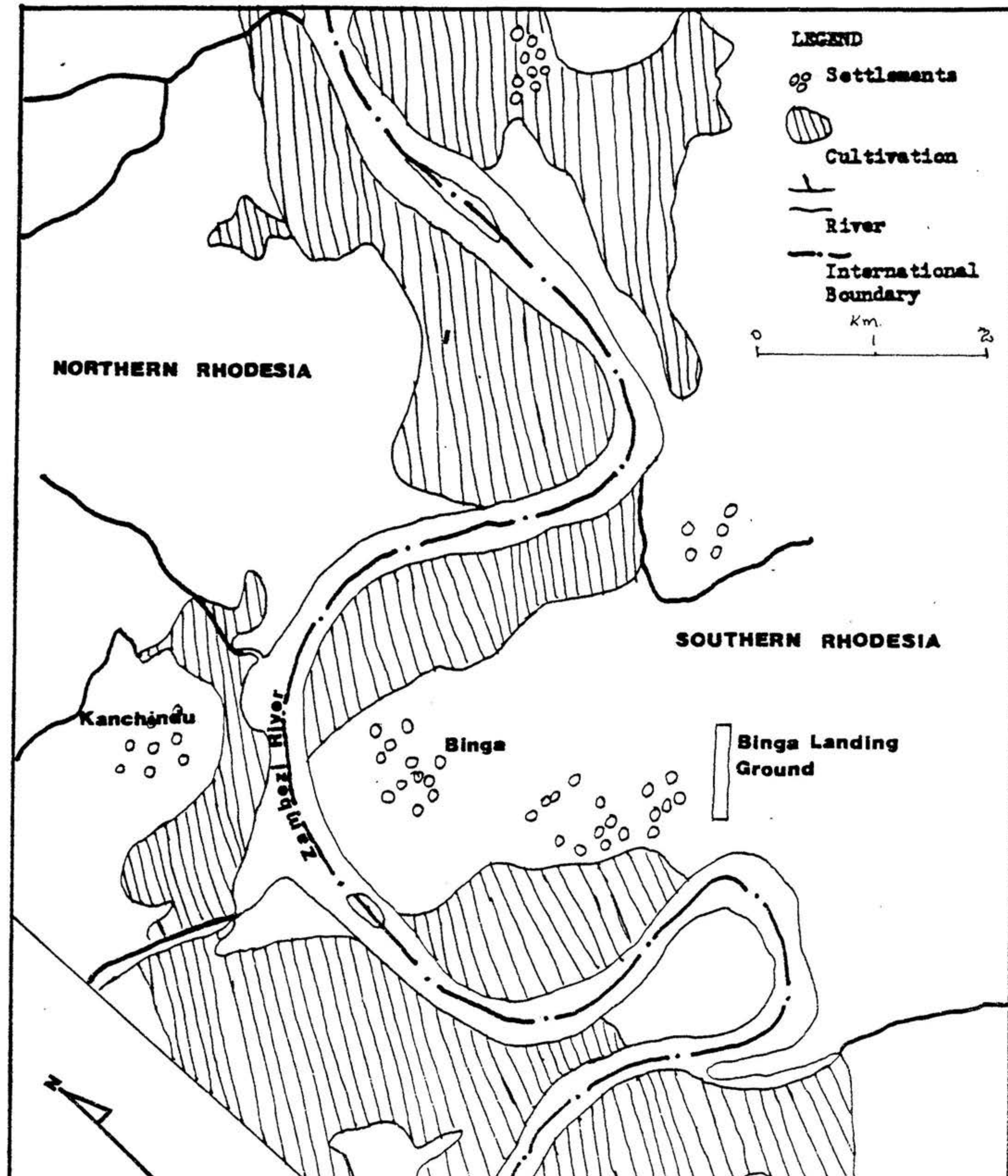
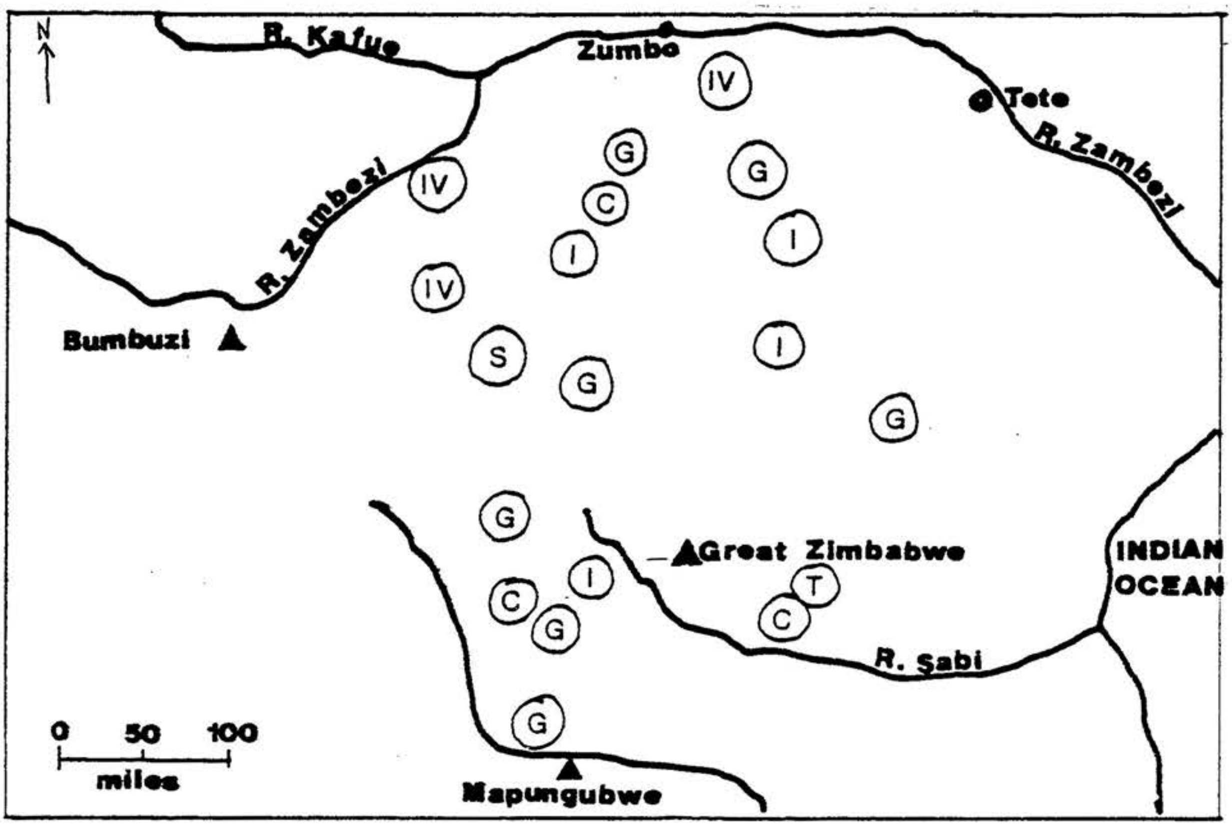


Fig. 3: 3 Product Site and Location of Important Trade Centres between the Zambezi and Limpopo Rivers before the Nineteenth Century



▲ Ruins

IV Ivory

G Gold

I Iron

S Salt

T Tin

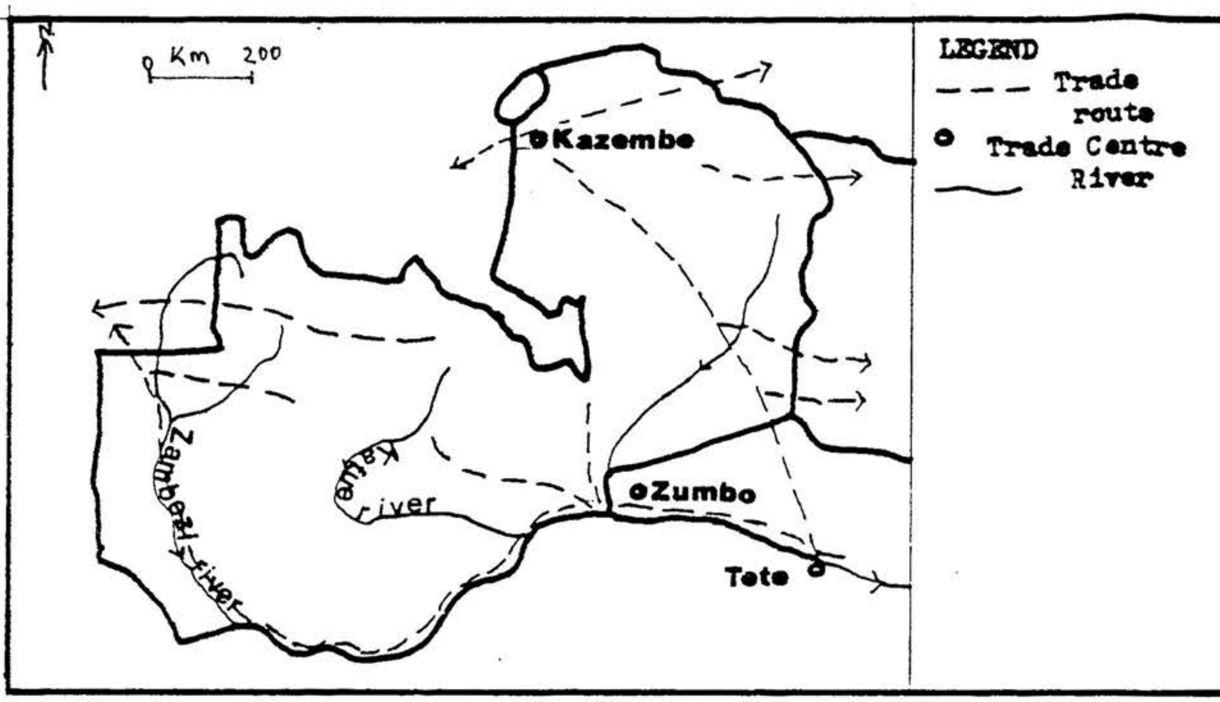
C Copper

Trade Centre

River

Source: Sutherland - Harris (1970), p. 248.

Fig. 3: 4 Trade Routes in Zambia during the Early Nineteenth Century



Source: Langworthy, H.W. (1972), p. 97.

people living inland. The importance of these fairs was that the participants (traders) paid taxes to the chief, in whose area the trade was conducted. It was this revenue that allowed rulers to develop empires (Newitt, 1973).

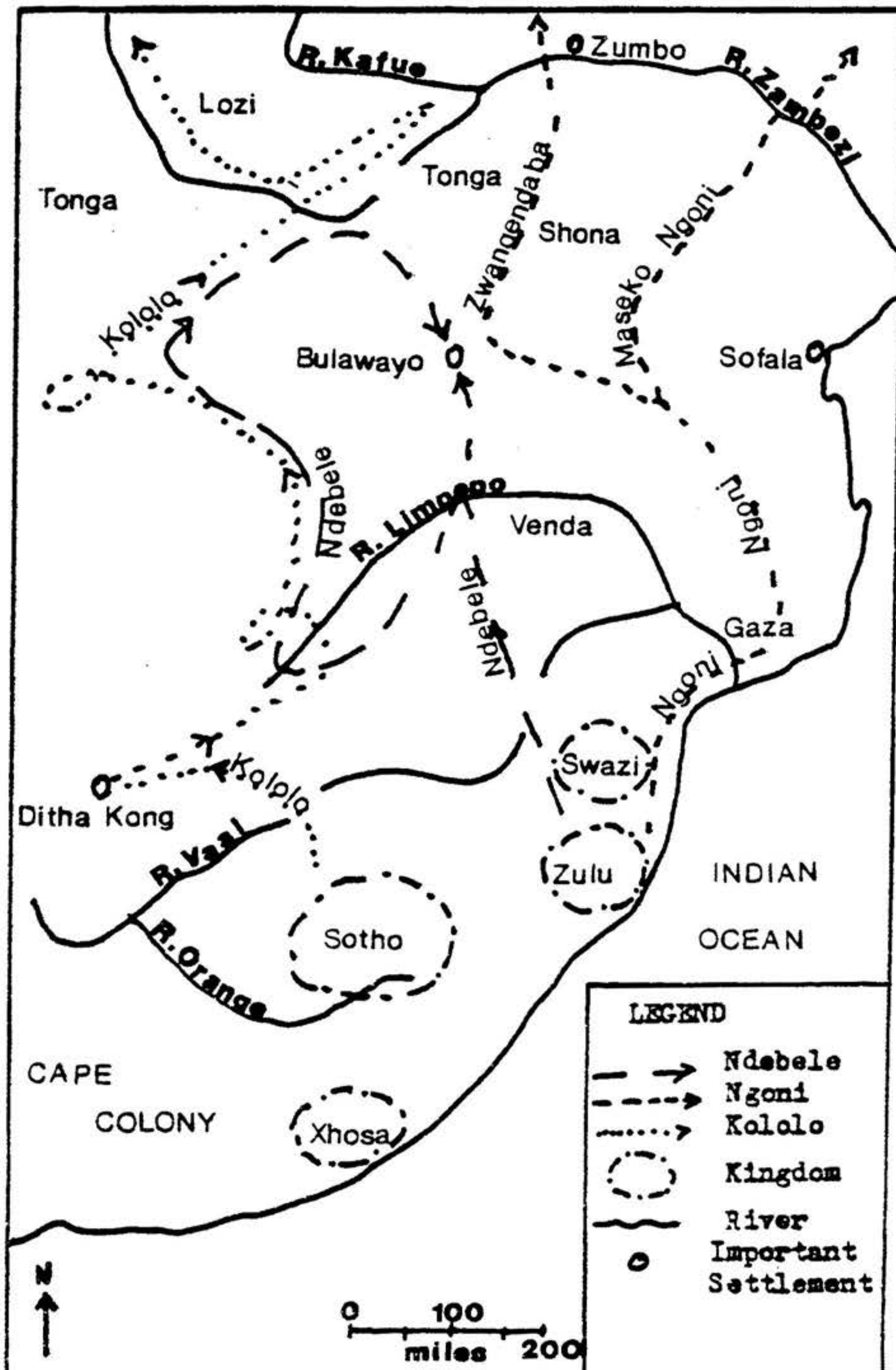
Indeed, archaelogical materials (especially those of ceremonial nature found along the Zambezi River at Ingombe Ilede (Fagan, 1967) and further up at Kasoko (Philipson, 1972), all in the Middle Zambezi Valley) do suggest that an important kingdom could have thrived in the Gwembe Valley in the pre-colonial period.

Economic Decline

The prosperity of the Middle Zambezi Valley kingdoms seems to have started declining only from the early 19th century. This was due rather to external destabilisation effects than to internally-inspired ones. Although the political scientists have emphasised the external factors, and we do not dispute their arguments, we shall, in our discussion, stress the internal factors.

The initial external destabilisation effects of some of the once well-established and prosperous Central African communities seem to have originated from the south. These are mostly associated with the creation of the Boer settlements at the Cape, and their northward expansion. This came to exacerbate the internal reorganisation of the Bantu people in coping with population increase and arable land decrease (Davidson, 1978). The consequential infighting of these people, especially in the Zulu Kingdom during the reign of Shaka, led some of the groups to head northwards in the migration mostly known as the Mfecane (Figure 3:5). The two groups which are most relevant to our discussion are the Ngoni and the Ndebele.

Fig. 3: 5 Routes taken by the Main Groups emigrating North from South Africa (Mfecane wanderings)



Source: Curtin, P. et al (1980), p. 307.

The Ngoni set off for the north about 1820 (Roberts, 1976). They crossed the:

> "Middle Limpopo and fell upon the old Karanga empire, reducing its chiefly palaces at Zimbabwe, Khami and elsewhere to empty ruins" (Davidson, 1978, p 248).

They crossed the Zambezi River at Zumbo towards the end of 1835 (Poole, 1930) and went as far as Lake Tanganyika, where they disintegrated into three groups. The first group settled on the eastern side of Lake Tanganyika, the second group went to what is now Malawi, and the third came to settle in what became Eastern Province of Zambia (Barnes, 1951).

What is most important for our discussion is the destabilising effects of their movements, especially in its early stages. This can easily be comprehended in that it seems to have taken the Ngoni fifteen years to complete the crossing of the region between the Limpopc and Zambezi Rivers.

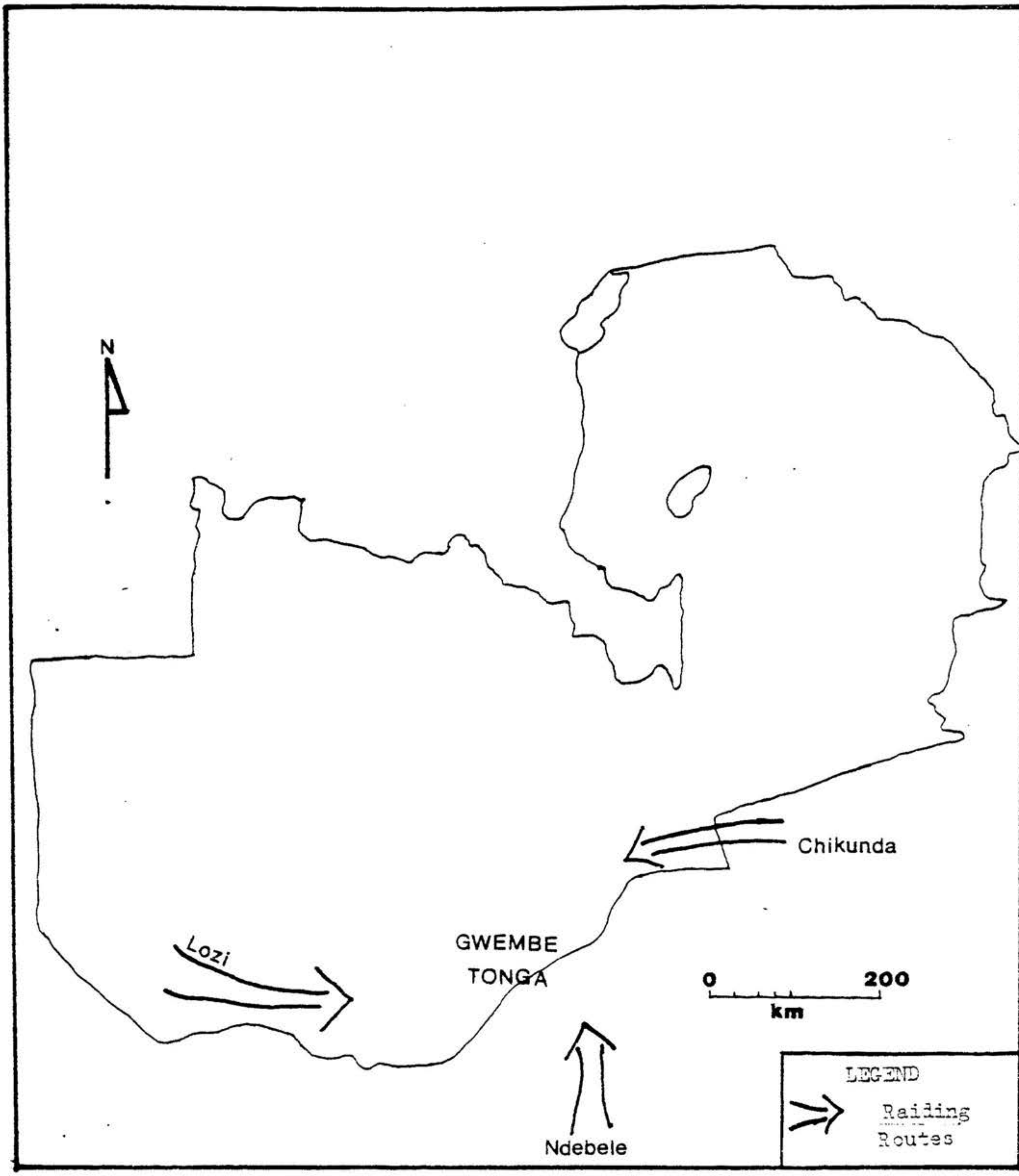
Later the Ndebele and Mzilikazi followed the path of the Ngoni, but once the Ndebele crossed the Limpopo River they settled in the

> "ravaged lands of the Karanga" (Davidson, 1978, p 248)

and went no further; but, without any past experience in the economic activities that led to the prosperity of the old Zimbabwe communities, the Ndebele, in their warrior tactics, came to rely to a very large extent on the conquest of neighbouring communities for their livelihood (Davidson, 1978). They thus aggravated the disruption that had been set in motion by the earlier Ngoni.

The Gwembe Tonga were one of the communities who were subjected

Fig. 3: 6 Raiding Routes of the Ndebele, Lozi, and Chikunda towards the Gwembe Tonga



Based on Roberts, A. (1976), p. 138, and Davidson, B. (1978), pp. 243 - 255.

to the Ndebele conquests, which extended to Zumbo in the north and the foothills of Manicaland in the east (Newitt, 1973). However, even before the coming of the Ndebele, the Gwembe Tonga were already subjected to occasional raids by the Lozi from the west and the Chikunda from the east (Figure 3:6) (Roberts, 1976). Nevertheless, the incursions of the Ndebele were more severe in that they even led some Karanga, living to the south of the Zambezi River, to cross it and come and settle among the Gwembe Valley people (K.T.E. 2/1 Gwembe District Notebook (G.D.N.)). Moreover, the Ndebele raids were more recent. The last raid is recorded to have been made around 1888 (Roberts, 1976).

These raids in search of food, grain, cattle and women by the Lozi and the Ndebele and for slaves - mostly young men and women - by the Chikunda all seem to have disrupted severely the old economic system upon which the earlier Gwembe Tonga diaspora was based. Furthermore, the Ngoni incursion, downstream of the Zambezi River, discouraged permanent Portuguese trading centres and thus, according to Newitt (1973), undermined:

> "legitimate trade and pleasant, peaceful agriculture" (ibid, p 226).

The Regional Impact of Colonial Incoming

In the second half of the 19th century, South African white settler incursion came to exert increasing influence on the economies based to the north of the Limpopo River. This was mainly due to mineral prospecting and to a lesser extent navigational prospects on the Zambezi River.

When gold was discovered in the mountain system of what became the

Transvaal in South Africa, there grew mounting speculation of possible extensive deposits to the north of the Limpopo River (Van Onselen, 1980). With this hope, the British South Africa Company (B.S.A.) under Cecil Rhodes, came to be given the mandate to prospect, bring under control and then administer the territories north of the Limpopo River on behalf of the British Crown. Cecil Rhodes sent agents to acquire mining concessions from the African Chiefs and in 1888 he managed to get a significant one from Lobengula of the Ndebele people (ibid).

During the initial prospecting period, the B.S.A. Company invested heavily in infrastructure development. The railway line from South Africa, which reached Bulawayo in 1897 and Salisbury (Harare) five years later, was their major infrastructural investment (Day, 1963). However, hopes of establishing a 'Second Rand' in Zimbabwe proved unfounded, as it turned out that it was in the territories north of the Zambezi River that extensive copper - not gold - deposits were confirmed and precisely located (Katzenellenbogen, 1974; Van Onselen, 1980). Thus the railway line was taken further north, passing through the Wankie coal deposits and crossing the Zambezi River at Victoria Falls and along the plateau towards the present-day Copperbelt. To make use of the laid infrastructure in southern Rhodesia, the B.S.A. Company changed investment policies from mineral prospecting to promotion of white settler agriculture (Mukarati, 1980; Mosely, 1983).

Since the Mid-Zambezi Valley happens to be an area which was never very attractive for white settlements, these developments might seem not to threaten any profound effects on its inhabitants; but, as we shall see later, they certainly came to influence the manner in which the Kariba Dam Resettlement Programme was planned and implemented in both territories.

To make ourselves clear, we shall briefly discuss the implications of the Zimbabwean portion of the valley in these early developments, and later we shall discuss in detail the development of the Gwembe Valley resources on the Zambian side.

Sebungwe Region in Southern Rhodesia

With the change of investment policy by the B.S.A. Company from mining development to the promotion of settler farming, the problem of limited arable land began to emerge (Kay, 1970; Mukarati, 1980). It seems there were two major factors behind this, the first being that even before the 'southern African incursion' the Highvelds were more attractive for human settlements, thus they were already densely populated before the mining companies crossed the Limpopo River (Palmer, 1977); and secondly these were also areas where some of the gold deposits had been found and thus where the infrastructural network, especially the railway line, had been laid (Kay, 1970; Mosely, 1983). The cool, pleasant environment also proved attractive to white settlers. In order to safeguard the interests of the settlers, the B.S.A. Company administrators, and the colonial government that took over the administration in 1923, came to draw policies which were more favourable to the new settlers in land utilisation.

The policies which related to land apportionment and labour laws seem to be more relevant to our discussion. The first pressures on the African population were set in motion in 1896 when they were alienated from their land, by force, and marginalised to less arable areas, which came to be known as African Reserves (Mukarati, 1980). This move was completed by 1902 but it came to be institutionalised with the enactment of the Land Apportionment Act in 1930 and the Land Husbandry Act in 1941 (ibid).

The obvious impact of these measures in the African Reserves was to make them, through the growth of population, more densely populated and, through time, overstocked with livestock. Being already in the less attractive Lowveld, the people of the Mid-Zambezi Valley did not initially experience directly the consequences of these land policies. In fact, they were left to their own agricultural devices, without any external help, while around them the whole context of life was changing. It was in matters of Southern Rhodesian and international proportions that the Mid-Zambezi Valley people came into direct involvement, under disadvantageous terms, with the land policies and colonial prescriptions for 'development' through mining and settler farming.

Paradoxically, when the African people were being marginalised in the reserves, it already became felt that the development of the Southern Rhodesian industrial and agricultural economy needed a large input of labour from those very sources. At the same time, the reorganisation and consolidation of the African agronomic systems in the new locations also required much manpower. There thus arose a labour demand conflict between the alien enclaves and the African agrarian systems, now defined - and confined - by reserve boundaries. Again, with the powers it had, the colonial administration developed and codified labour policies which favoured the settler economy and the mines, undermining thereby the economies of Africans.

In an effort to draw labour from the African reserves, the colonial administration enacted the hut tax and later the poll tax. These taxes could not be paid in kind, but in monetary terms only. However, the African people came to seize the opportunities, afforded by the industrial settlements as agricultural product markets, to produce crops which could earn them cash (Palmer, 1977). The neighbouring Shangwe people, in the Mid-Zambezi Valley, had shown remarkable tobacco farming expertise between 1891 and 1921 (Kosmin, 1977), but each new policy inhibited African participation in any market economy and came to increasingly aggravate the land pressure and food demands in the African Reserves (Palmer, 1977; Kasmin, 1977; Szentes, 1969). Since the taxes did not consider regional variations, they were widely enforced and people living in the Mid-Zambezi Valley also came into the fold of labour provision to the alien economic enclaves.

It was much later, in the late 1950's, when the decision was made to go ahead with the Kariba Dam Hydro Electric Project, that the resettlement of the people living on the southern shore of the Mid-Zambezi River came to be dictated by these land policies. Being late by over 25 years, they had consequently to be resettled in much deprived areas, as most of the relatively arable portions were already densely populated. Thus the area that the Zimbabwe Tonga occupy is still one of the least developed parts of Zimbabwe (Weinrich, 1977; Du Toit, 1985) and the people are among the poorest in the whole country (Brand, 1981; Scudder, 1982).

The Gwembe District

Early Colonial Activities (c. 1880-1940)

After the cessation of the trade between the East African coast and the interior, the Mid-Zambezi people seem to have had a relatively quiet existence. In fact, by 1877, the Portuguese had all withdrawn from their trading centres in this area (Philipson, 1972). It was only with the subsequent encouragement of mining companies that missionary activities were promoted in the valley (Rotberg, 1965). The Jesuit Fathers were the first Christian missionaries to work in this area, as from 1880. However, they soon retreated to Wankie for fear of a disease which had led to the deaths of some of their members (K.T.E. Gwembe District Notebook, p 215). Actually, the Gwembe Valley was seen to be evangelically unrewarding, as the people did not easily convert to Christianity (Rotberg, 1965).

Records of the early missionary activities in the Gwembe Valley (K.T.E. Gwembe District Notebook) show that the Primitive Methodists' Mission were the first ones to establish a permanent station in the Gwembe Valley. They opened the first mission at Kanchindu in 1908. In 1916, they opened a school church at the mission, and by 1919 they were regarded as of great assistance because of their provision of medical facilities to the community.

Other missions came much later. The Pilgrim Holiness Church opened a mission at Chiboboma in Chief Chipepo's area in 1950, the Salvation Army came to work at Chikankata in the north-east of the district in 1956, and the Jesuits came back to open a mission at Fumbo, near Chief Mungumbwe's village, in 1958.

[illegible] the drawbacks experienced by the Jesuit Fathers, later missionaries in Gwembe Valley seem to have come very cautiously. As we have seen, they now started with the provision of education and medical facilities. In fact, the siting of their mission centres at important chiefs' villages eased their acceptance by the general public.

Apart from these Christian mission activities in the Gwembe Valley, the only other colonial administration interest in the area, in the first three decades of this century, was mainly in the establishment of administrative centres. Records in the Gwembe District Notebook (K.T.E.) show that the first administrative centre was opened at Sijoba in 1902. A second one was opened at Chirundu the following year and, much later, Buni was also opened. In 1908, they were all merged into one district, called Gwembe, but these sub-districts were not then operating on a permanent basis. The District Commissioners visited them monthly to enforce and collect the taxes, the first collection being in 1904 in this area.

To pay the taxes (first hut tax, later poll tax), people had to emigrate to the south where they could get employed and earn cash. For the Gwembe Tonga, the route to the south was enticing for a number of reasons. To start with, even up to the 1950's, the Gwembe Tonga living on both shores of the Zambezi River regarded themselves as a homogenous group (Colson, 1960). Thus, the Northern Rhodesian Tonga were pulled to the Southern Rhodesian industrial and agricultural sectors' labour demands, as we saw in the last section. Hellen (1968) notes that the 'Zambezi boys' were already trekking to the south by 1900. These patterns of labour movement that developed during this early period tended to persist.

Secondly, the physical geography of the area, especially the Zambezi escarpment, tended to act as a barrier between the valley people and those on the plateau. It was much easier to climb the Southern Rhodesian plateau (Scudder, 1962; Allan, 1967; Hellen, 1968).

Thirdly, being on the border with Southern Rhodesia, the Gwembe Tonga came to be easy prey for the labour recruiting agents who used to wait for people crossing the borders (Van Onselen, 1980), and the

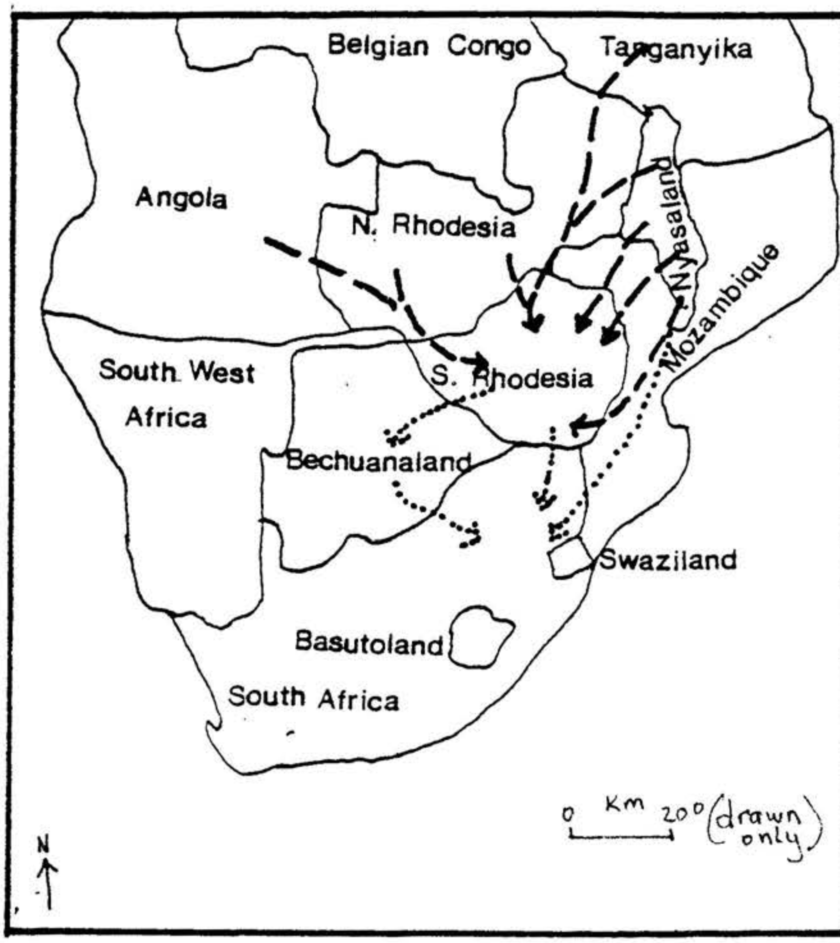
Table 3:1 Gwembe District Migrant Labour, Period and Region of Immigration, 1952.

Period (year)	Locally within Province		Outside Province but within Territory		Southern Province
	Urban*	Rural	Urban	Rural	
Under ½	8	84	1		6
½ - 1	4	13	1		5
1 - 2	15	22	2	1	28
2 - 5	16	15	6	3	7
Over 5	4	5	4	2	7
Total	47	139	14	6	
Sub-Total	186		20		
Grand Total	259				53

Note: * Urban includes the townships of Choma, Pemba, Monze, Magoye and Mazabuka.

Source: S.E.C. 2/1016, Gwembe Tour Reports, No. 1, 1952. Annexure H.

Fig. 3: 7 Central and Southern Africa: Dominant Labour Migration Routes 1900 - 1933

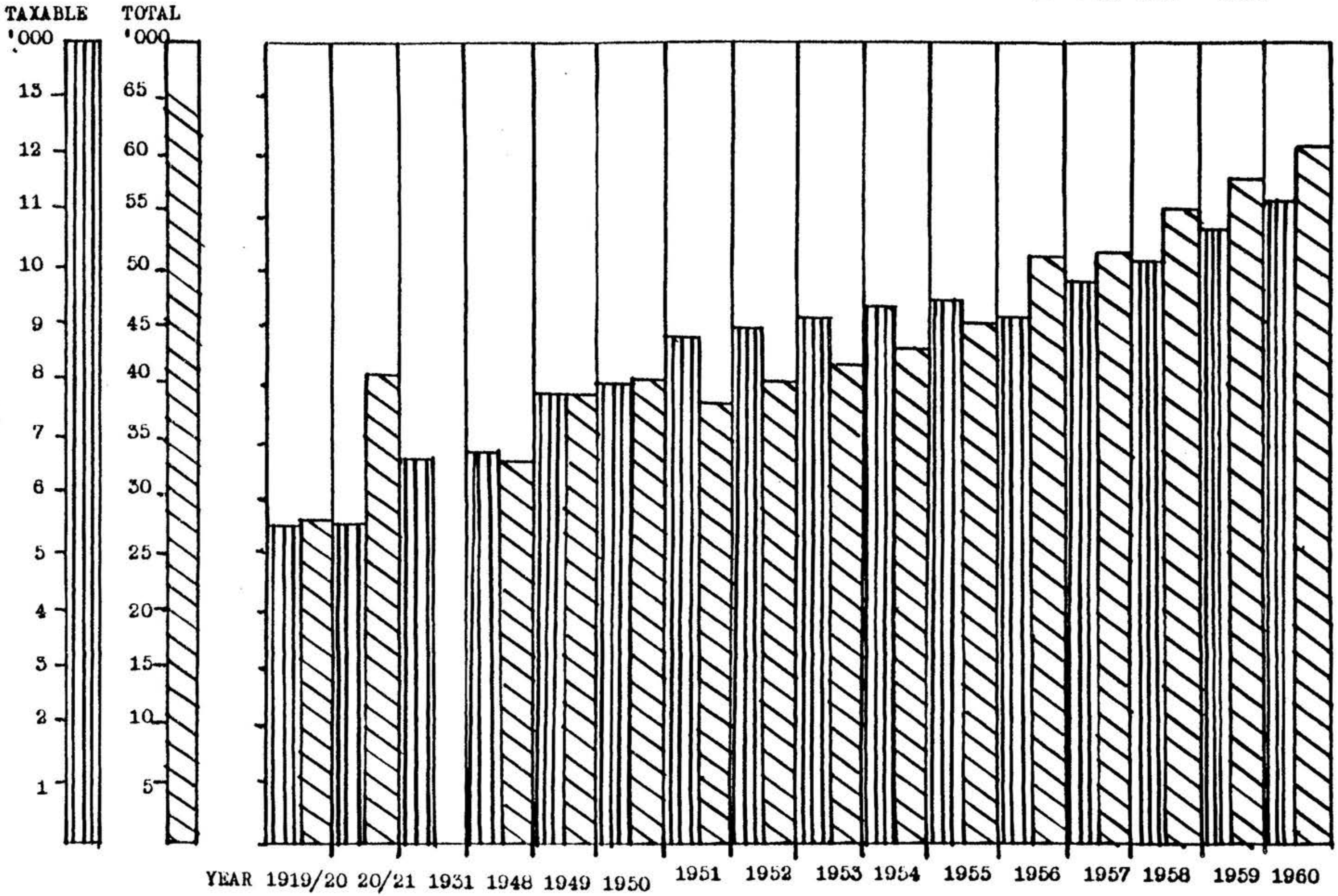


- - - - - Routes to Southern Rhodesia

.... Routes to other countries

Source: van Onselen, C. (1980), p. 238.

Fig. 3: 8 Taxable Population in Relation to Total Population in Gwembe District (valley) 1919 - 1960



Source: K.T.E. 2/1 Gwembe District Notebook p. 364.

most important reason of all was that initially the B.S.A. Company saw the other British Central African territories as a source of labour (ibid). Figure 3:7 shows the direction of migrant labour flows. Chirundu was an important early crossing point. Statistical records of labour emigration from the Gwembe Valley seem to have started appearing in the District official records in 1919 and more systematic recording started in 1948. Figure 3:8 shows the total taxable population (adult male only) in relation to the total district population between 1919 and 1960, and Table 3:1, of the period and region of employment, shows the attraction of Southern Rhodesia, especially for one-year to two-year migration periods. When considering the circumstances of Gwembe agriculture during these four decades, the volume, nature and directions of these movements need to be held in mind.

Interventions in Agriculture in Gwembe Valley

Like the Zimbabwean portion of the valley, the Zambian side did not initially attract white settlers. It was, rather, the Plateau Tonga area which attracted white farming settlements (Hellen, 1968). Thus, the people were left very much to their own agricultural devices.

The earliest interest in agricultural promotion, by the colonial administration, for the Gwembe Valley seems to have been made in 1920. This was based on a report looking at the prospects of cotton growing in Northern Rhodesia (B.S. 3/179). This report was very pessimistic concerning prospects of cotton growing in the territory, but it cited the Zambezi Valley as an area where cotton, under irrigation, could successfully be grown. The soils were seen to be typical and probably suited for the Egyptian variety. However, there does not seem to have been any response to this suggestion until much later, as we shall come to see.

A thorough ecological survey of the Gwembe Valley was undertaken between 1932 and 1934 and the results were firstly published in 1937 (Trapnell and Clothier, 1957)[1]. The main purpose was to explore the natural resources of the country and to study the native (African) agricultural systems (ibid).

In its description of the Gwembe Valley system, the survey (Trapnell and Clothier, 1957) noted its complexity; but it also acknowledged its virtues[2].

Trapnell and Clothier saw the recurrent food shortages of the valley as typical of areas subjected to limited rainfalls and also as being due to the 'adherence of certain groups of villages to restricted or exhausted land' (ibid, p 48); but they saw the situation as being aggravated by the new phenomenon of concentrated populations in marketing, or administration, centres; and also the confinement of the population into Reserves.

The needs of a cash economy, which led people to grow cash crops with the aid of alien agricultural practices, were seen to be compromising the needs of a traditional agrarian system. This had already resulted in the abandoning of multiple-cropping and customary rotation systems. They discouraged this new phenomenon and called for the reuse of the older systems.

They also saw the tradition of livestock rearing as exacerbating the problem of land shortage. Figure 3:9 shows the increase of livestock in Gwembe Valley in the period from 1914 to 1960. In this 46-year

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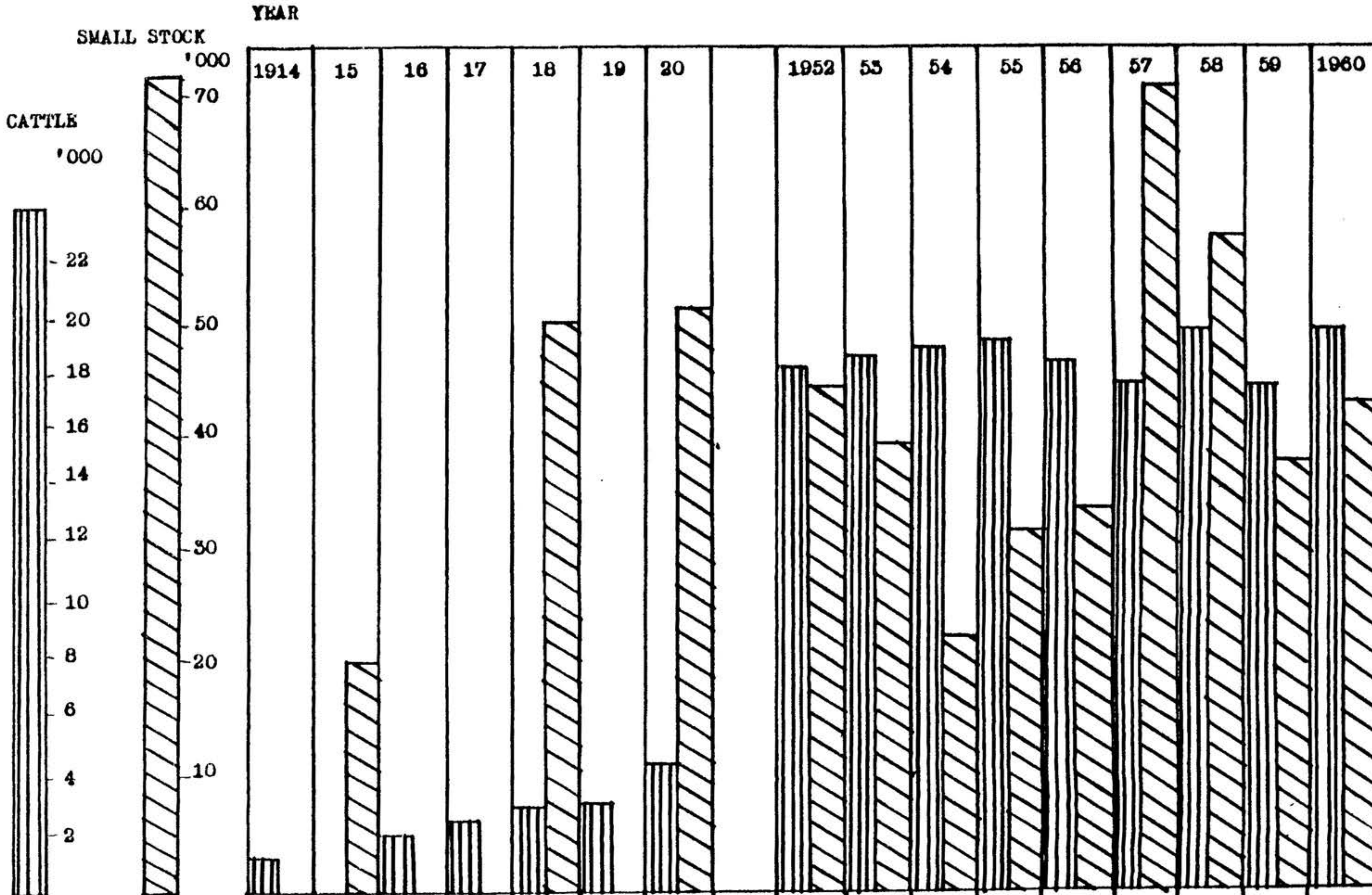
1. This is the second edition
2. The Gwembe Valley indigenous agrarian system is discussed in detail in Chapter Four.

Fig. 3: 9 Livestock Population in Gwembe District (valley) 1914 - 1960



SOURCE: Data extracted from the K.T.K. 2 (1902 - 1963) Gwembe District Notebook. P. 210

period, the cattle population had increased from 1,640 in 1914, by a factor of 12, to almost 20,000 in 1960; and the population of the small livestock (sheep, goats and pigs) had doubled from 20,000 in 1914 to more than 40,000 in 1960. Trapnell and Clothier also called for caution in the prevalent animal husbandry practices, though they did not give any suggestions. However, they saw the European influence in the Gwembe Valley as:

> "destroying what is best in the natives' traditional agriculture and providing in its place the defects of an alien system" (ibid, p 49)

The Trapnell and Clothier proposals eventually came to be endorsed in the Five Year Plan of the Southern Province, which was published during wartime in 1943; but, before intervening, the plan called for another feasibility study which was going, among other things, to look at:

1. The nature of the existing land use system.

2. Prospects of resettling some people, especially in areas where the optimal number of 20 people per square mile on the traditional agronomic system had been surpassed.

3. Design of a proper agricultural strategy, and

4. Closer consideration of prospects of cash crop production, especially cotton and tobacco.

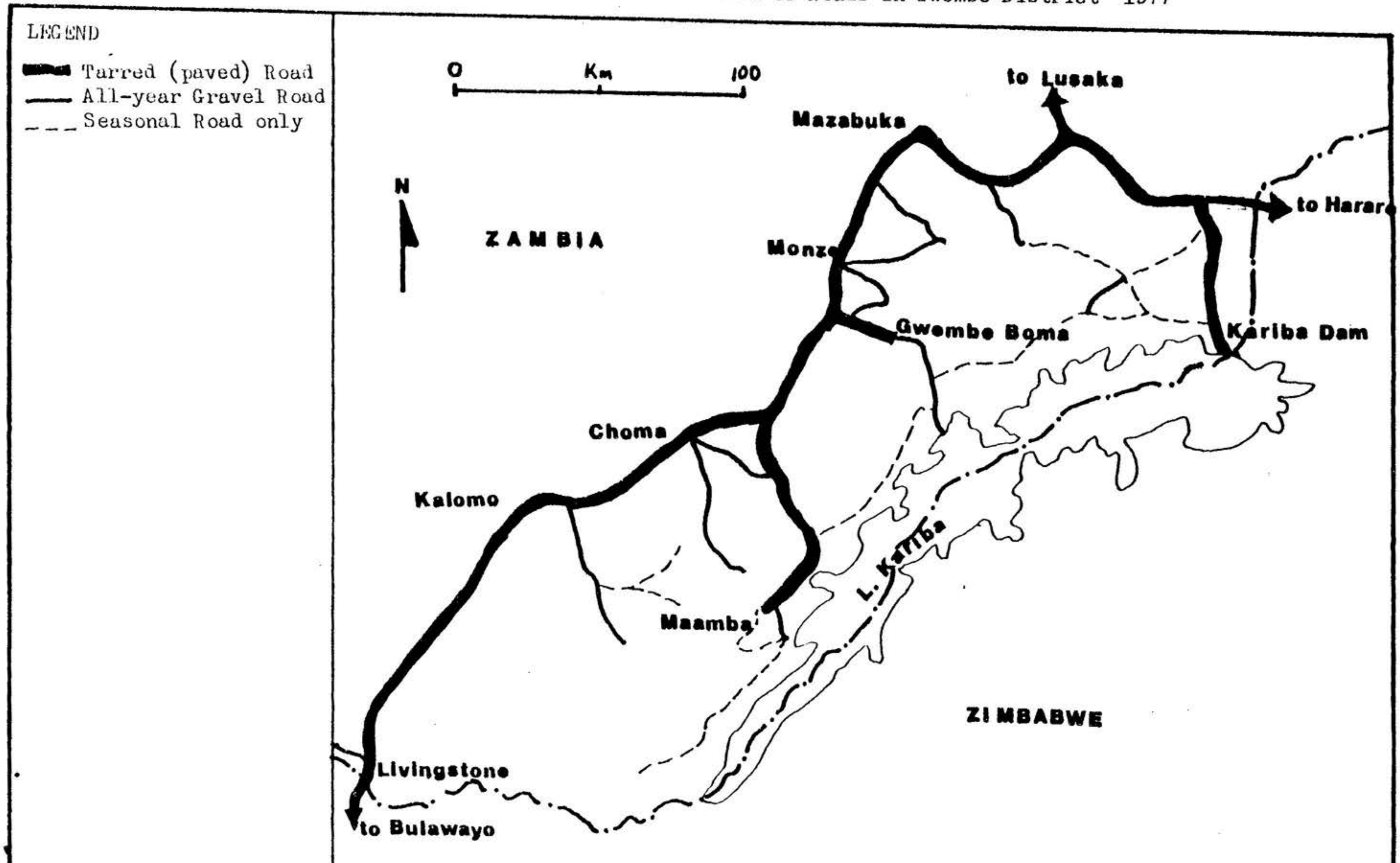
The plan also called for the development of the communications links. It cited three roads as a priority. These were the Chirundu road; the road from the Gwembe Boma, at the plateau to the Chief Chipepo's village in the valley; and the improvement of the road from

Masuku Mission to Kanchindu Mission. It deferred the consideration of river transport on the Zambezi until a much later date; but it called for a construction of another road running near the base of the escarpment and traversing the whole length of the valley. Between 1948 and 1956, all these roads were constructed and developed (Colson, 1960). The situation has remained almost the same to the present, with the only exception of the Batoka-Maamba road which has been reimproved and paved into Class 1 standard because of the coal mining, at Maamba, that it serves (Elgie, 1975). Figure 3:10 shows the road network in Gwembe district.

Apart from road construction, there does not seem to have been anything done in response to the proposals of the Five Year Plan of the Southern Province (1943). However, records in the Gwembe District Notebook show that the colonial administration came to initiate the Communal Granary Scheme in 1944, directed towards famine prevention, and which had been suggested in 1931 as a specific drought relief intervention. The basic assumption was that the recurrent food shortages in the valley were due to the inadequacy of the Gwembe traditional agrarian system which paid more attention to the winter gardens, in the alluvial deposits along the river, rather than the summer fields on the higher grounds. Of course, this view had already in 1937 been seen wanting by Trapnell and Clothier. Scudder (1962) attributes the food shortages of these earlier times mainly to natural catastrophes (e.g. drought, flood and pests). However, the Order was issued which compelled people to make more use of the upland fields.

To stock food for drought relief, the Order required every adult to contribute annually a full paraffin tin (a 4-gallon tin) of threshed millet to the communal granary, but it was later amended to two tins

Fig. 3: 10 Seasonal Condition of Roads in Gwembe District 1977



Source: Elgie, I.D. (1975), p. 214.

annually per adult. If full contributions were made, it was assumed that a reserve of one bag per family of five would be assured.

The Order was initially imposed in Chief Mwemba's and Sinazongwe's areas. In 1945, it was extended to Chipepo's area and in 1946 to Simamba's area.

Although statistical records are scanty to enable an accurate assessment of the scheme, the little available in the Gwembe District Notebook show that in 1947, 4,000 bags of millet were issued to people from the communal granaries; and in 1951, in Chief Mwemba's area alone, 7,562 tins of millet, out of 11,333 expected, were collected. This was seen to be enough for only two months (Gwembe District Notebook).

Apart from the promotion of millet cultivation in the summer fields, under the Communal Granary Scheme, the colonial government also came to impose the Cassava Order in 1949. From 1948, a four-acre cassava nursery had been planted at Gwembe Boma. After the Order was issued, the cuttings came to be distributed to some villages, such as Lukonde, Chiluudi, Fumbo, Sinazongwe, Mwemba, Simamba and Sipopo. Later in 1951/2 a large-scale distribution of cuttings, covering the whole valley, was done and ¼-acre nurseries were established in most villages; and, in addition, every household was under an obligation to prepare and plant its own garden of at least 200 plants.

However, these orders, though inspired under good auspices, were generally regarded with animosity by the intended beneficiaries. To enforce them, the Boma officials had to exert increasing pressure. In extreme cases, people who failed to implement the order were 'severely punished' (Tour Report No. 2, 1952). Table 3:2 shows a summary of the activities under these drought relief orders.

Table 3:2 Summary of Drought Relief Programme Activities in Gwembe District, 1931-1953.

1931	Communal Granary Scheme proposed.
1944	Scheme started in Chief Mwemba and Sinazongwe areas.
1945	Scheme extended to Chipepo.
1946	Scheme extended to Simomba.
1947	4,000 bags of millet distributed from the scheme supplies.
1948-50	Cassava nurseries established at Gwembe Boma.
1951	In Chief Mwemba's area alone, 7,562 tins of millet collected out of expected 11,333 tins.
1951-52	Cassava cuttings distributed in villages and field nurseries established in most villages.
1952-53	Sorghum supplied under the Seed Multiplication Programme.

Towards the mid-1950's, records tend not to mention these Orders nor any agricultural promotion activities. This seems to be due to the increasing attention and publicity that the proposed hydro-electric scheme on the Kariba Gorge was getting. Records tend to discuss more the problem of the consequential resettlement of people from the valley bottom to the upland.

Though we are here not very much concerned about the <u>pros</u> and <u>cons</u> of the Kariba Hydro-Electric Project, it is necessary that we show the context in which our discussion [illegible] its development. Again, we shall have to come back in history to the time that the Kariba Gorge initially attracted hydro-electric generation interest, and perhaps distracted attention from the inherent problems of agriculture.

The Evolution of the Kariba Dam Hydro-Electric Project and the Navigational Prospecting of the Zambezi River

The history of the Kariba Dam Hydro-Electric Project has now been well documented (Clements, 1959; Anderson, n.d.; Bolton, 1983). Thus, we do not need to go into detail here; but we still need to show how its gestation came to thwart the development of other resources in the Gwembe Valley.

The studies, mentioned above, tend to show that the earliest interest in the Kariba Gorge grew from a desire to find a suitable site for a railway bridge crossing the Zambezi River. The first formal survey was conducted by William Keppel in 1891. However, in 1898, Sir Charles Metcalfe, through his own studies, came to recommend the site near Victoria Falls, mainly because it enabled the route of the railway to pass through the Wankie coalfields (Anderson, n.d.).

In the early twenties, the Southern Rhodesian government came to consider the Kariba Dam when they were looking for suitable sites for establishing irrigation schemes. Their feasibility studies, which included measuring the flow of the Zambezi River at the Kariba Gorge, were conducted from 1912 to 1914. However, the survey aborted (Clements, 1959).

It was only in 1925 that the hydro-electric potential of the Kariba Gorge was considered, together with those of the Mupata Gorge and the Victoria Falls (Anderson, n.d.). Yet it was only when it was reported in 1937 in South Africa that the Kariba Gorge Hydro-Electric Scheme could revolutionise the two Rhodesias, that the interest to dam the site was heightened (ibid).

When the project came for official consideration, there arose a difference of opinion between those of the territorial government in Northern Rhodesia and those of the Southern Rhodesian government. Apart from technological and economic arguments between the Kariba Gorge and the Kafue Gorge as respective sites, records in the Gwembe District Notebook show that in 1944 the Northern Rhodesian government expressed its resentment regarding the type of resettlement that the Kariba project entailed. Apart from mere shift of people, they saw the project as removing people from an area where the soils were excellent for their agricultural system, as Trapnell and Clothier (1957) had observed, and thus, potentially, from the most suitable place for their occupation.

However, in 1946, the Central African Council, which was the fore-runner of the Central African Federation, appointed a Hydro-Electric Commission which was going to look at, amongst other things, the merits and demerits of the two projects (Kariba and Kafue) and also the prospects of establishing the Zambezi Valley Authority, which could, in time, become responsible for resource development in the whole length of the Zambezi Valley Basin, from the source to the mouth in the Indian Ocean.

In May 1947, the Inter-Territorial Hydro-Electric Power Commission held its first meeting in Salisbury (now Harare). Their main discussion was centred on the water rights implications of the proposed dam at Kariba Gorge. Because of the magnitude of the task, they recommended a conference in which concerned governments could attend and in which the object of setting up a Zambezi River Authority (Z.R.A.) could be discussed; but, two months later, the Acting Director of Water Development and Irrigation in Salisbury expressed his views regarding the idea of setting up of the Z.R.A. He felt that, since the project was mainly in the interest of the two Rhodesias, there were bound to be some conflicts with other riparian territories. Thus, he suggested that the scope of the proposed authority should not be made too wide in the first instance.

Towards the end of 1947, G.A. Jellicoe submitted a proposal to the Hydro-Electric Commission entitled, 'The Case for a Commission to Report Upon the Establishment of a Zambezi Authority', in which he discussed the economic implications of the project on the Central African economies. He seems to have based his arguments mainly on the Tennessee Valley Authority (T.V.A.) model in the United States of America. He emphasised the importance of navigation on the Zambezi River as it could 'ultimately be the only way of opening the resources of Central Africa competitively to the world market' (S.E.C. 3/465, p 2).

In July 1948, the Central African Council Secretariat, in Salisbury, came to draw up the agenda for the proposed 'Conference on the Utilisation of the Zambezi River' (S.E.C. 3/618). However, on 28th August, the Governor of Southern Rhodesia sent a telegram to his Northern Rhodesian counterpart, suggesting that a prior conference for the two territories only should initially be held, before bringing in other riparian territories. The response from Lusaka was that they also felt that the idea of establishing a Z.V.A. was distinctly premature. They suggested more study of the prospects of the hydro-electric projects (Kariba and Kafue) (S.E.C. 3/618).

Thus, the Hydro-Electric Power Commission went ahead with its own investigations. It came to report in 1951 that the Kariba Dam was the more suitable locality as a first development rather than the Kafue project (Anderson, n.d.). This consideration came to be supported in 1954 by a French consultancy firm, M. Andre Coyne (Federal Government, 1954); and from this basis the Federal Government announced in March 1955 that it had decided to proceed with the construction of the Kariba Dam (Anderson, n.d.).

Navigational Considerations on the Zambezi River

At the time that the cases for the hydro-electric schemes and the Z.V.A. were being discussed, other interests were also busy looking at the practical prospects of using the Zambezi River and other Northern Rhodesian watercourses for navigation purposes.

David Livingstone, the most famous Central African explorer and missionary of the 19th century, had already considered using the Zambezi River as a waterway into Central Africa. He soon discovered in 1858, however, that the Kaborabassa rapids, in the Lower Zambezi Basin, inhibited navigational use of the river above Tele (Roberts, 1976).

It was much later in 1941 that the matter of navigational use of the Zambezi River came under serious modern consideration. Official records (S.E.C. 3/507) show that during the Southern Rhodesian maize shortage, in 1941, the Governor General of Angola suggested, to the Prime Minister of Rhodesia, the use of the Upper Zambezi River water-course in the bringing in of maize stocks from Angola; but, when the matter was referred to the Provincial Commissioner in Mongu, on the Upper Zambezi River, he advised that, due to the lack of suitable barges and the shortage of paddlers as 'many able bodied men have left for the Rand and Southern Rhodesia' (S.E.C. 3/507), it could not possibly be done.

However, in Northern Rhodesia, the interest in navigational development was still high. In August 1944, Mr. Tom Page passed a motion in the Legislative Council urging the government to engage the services of a Water Engineer to appraise navigational prospects of the Northern Rhodesian waters. In 1946, Professor Frank Debenham came to doubt the feasibility of large-scale improvement of the Zambezi River with a view to making it navigable (S.E.C. 3/628). In the following year, he supported the project of improving only the Upper Zambezi River (S.E.C. 1/121).

When the government engaged Mr. Smart in 1948 to advise it on navigational prospects in the territory, the District Commissioner of Gwembe urged him to consider, in his study, the Zambezi River course between Livingstone and Feira, as well. However, when the terms of reference came to be drawn up, Mr. Smart was required to consider <u>only</u> the Upper Zambezi River and other watercourses in Northern Rhodesia.

This discussion on navigational considerations on the Zambezi River throws a new perspective on how the Northern Rhodesian government viewed the Mid-Zambezi Valley development. It shows that, even though the government was wary about the resettlement that the Kariba Hydro-Electric Project entailed, it did not seriously consider any other type of development in the area either.

Resettlement and New Economic Activities

When the decision finally arrived to go ahead with the Kariba Dam project, distinctions were clearly marked between the construction of the dam - and hence its operation - and that of resettling and compensating the people affected. Whilst the former was a Federal Government concern, the latter became a responsibility of the territorial governments, though the costs were to be borne by the Federal Power Board (Colson, 1971).

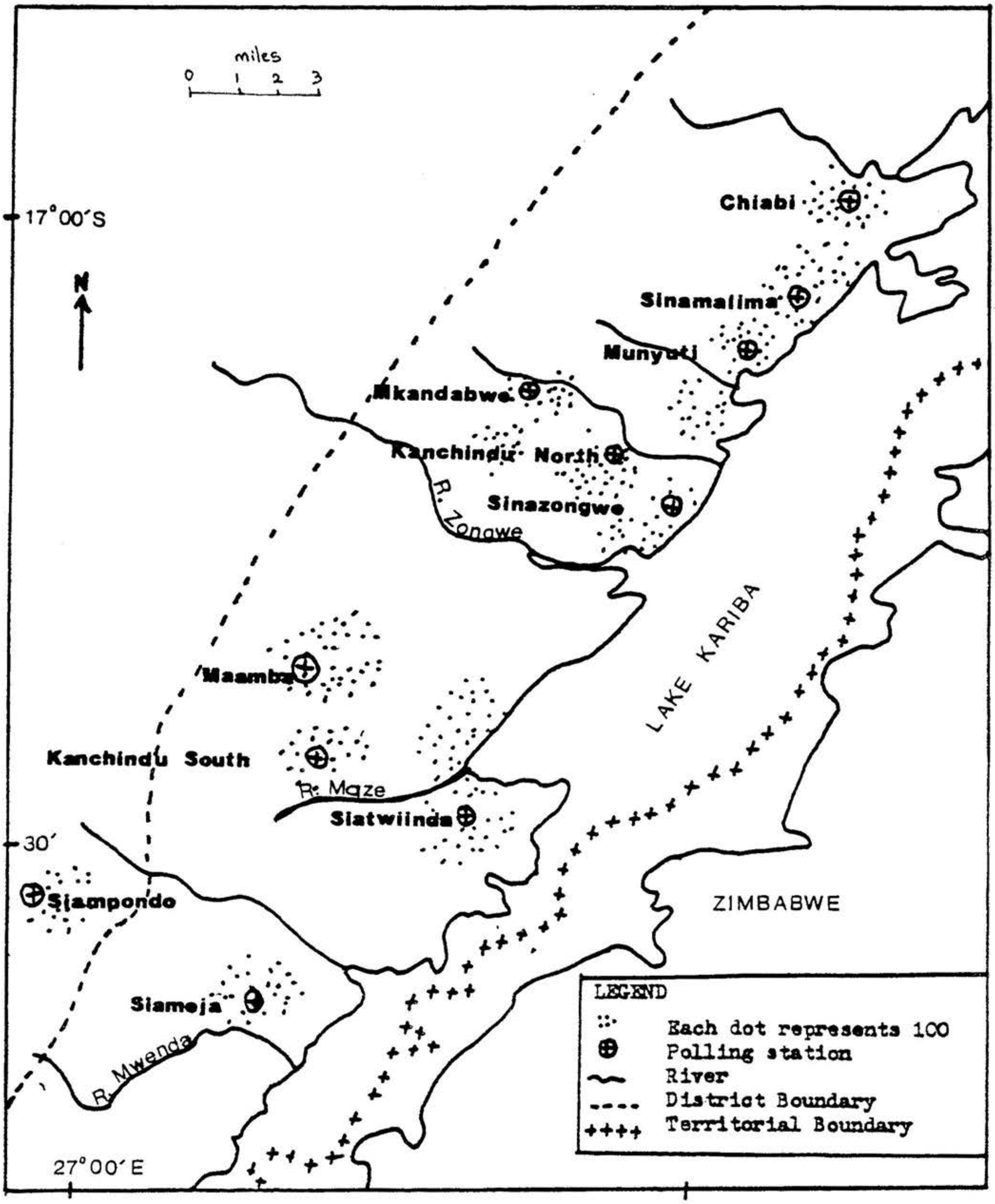
Thus, despite the 1944 Northern Rhodesian government reservations about the resettlement programme, in connection with the Kariba Project, it came to assume sole responsibility for it on the northern banks. Its initial work was to carry out a land capability survey so as to identify and ascertain the agricultural potential of the areas where people were to be resettled. Its preliminary survey of 1956 revealed that the two possible areas where two of the larger chieftaincies, Chipepo and Mwemba, were to be resettled had insufficient land (S.E.C. 2/43).

This situation was aggravated by the decision of the dam designers, in June 1956, to increase its height so as to increase its power-generation capacity. This meant that the lake was going to inundate more land and hence more people had to be resettled on much higher ground (Colson, 1971).

Official records of the resettlement programme (S.E.C. 2/143, vol. 11) show that the resettlement of Chief Mwemba's people was the most problematic issue. The initial plan was to resettle them near Masuku Mission, on the plateau, but the people could not agree to this. The resettlement agency was also reluctant to resettle them in the area between the rising lake and the escarpment, as their surveys had already shown that the land was below the optimum agricultural requirements. The people were also themselves hesitant to be moved much closer to the escarpment because of the bilharzia which was rampant among the people living along the Nangombe River (Colson, 1971).

To resolve the conflict, Chief Chipepo's people were resettled in Lusitu area, below the Kariba Dam, where extensive relatively good land lay unoccupied; and Chief Mwemba's people were widely scattered in Gwembe South region. Since the people had some limited choice on where they wanted to site their villages, they settled mostly along the lake shoreline and the lake tributaries (Figure 3:11). Scudder and Colson (1972; 1979) have been conducting a long-term field study on the Gwembe Tonga, monitoring the adaptive techniques devised by the Tonga to come to terms with the new environment. The study seems to suggest that the Gwembe Tonga have tended to adapt their long-evolved socio-ecological technological systems in a new environment. These people's response to the lake fluctuations is the core of our discussion. Thus it is treated in detail in chapter six.

Fig. 3: 11 Human Settlements and Concentrations in Gwembe South 1969



Source: Zambia Republic (1975) Census of Population and Housing, Gwembe District.

Economic Activities

As compensation for the relocation and for the poor quality of most of the areas where people were resettled, the Northern Rhodesian government envisaged that people would adopt fishing - a new opportunity in the rising lake. Incidentally, it was then generally believed in official government circles (S.E.C. 2/143) that, due to the fast flow of the Zambezi River in this region, the Gwembe Tonga had not hitherto developed into keen fishermen. This view is disputed by Scudder (1960) who shows that, despite the hydrological reasons which hampered large-scale fishing in Mid-Zambezi Valley, the Gwembe Tonga considered:

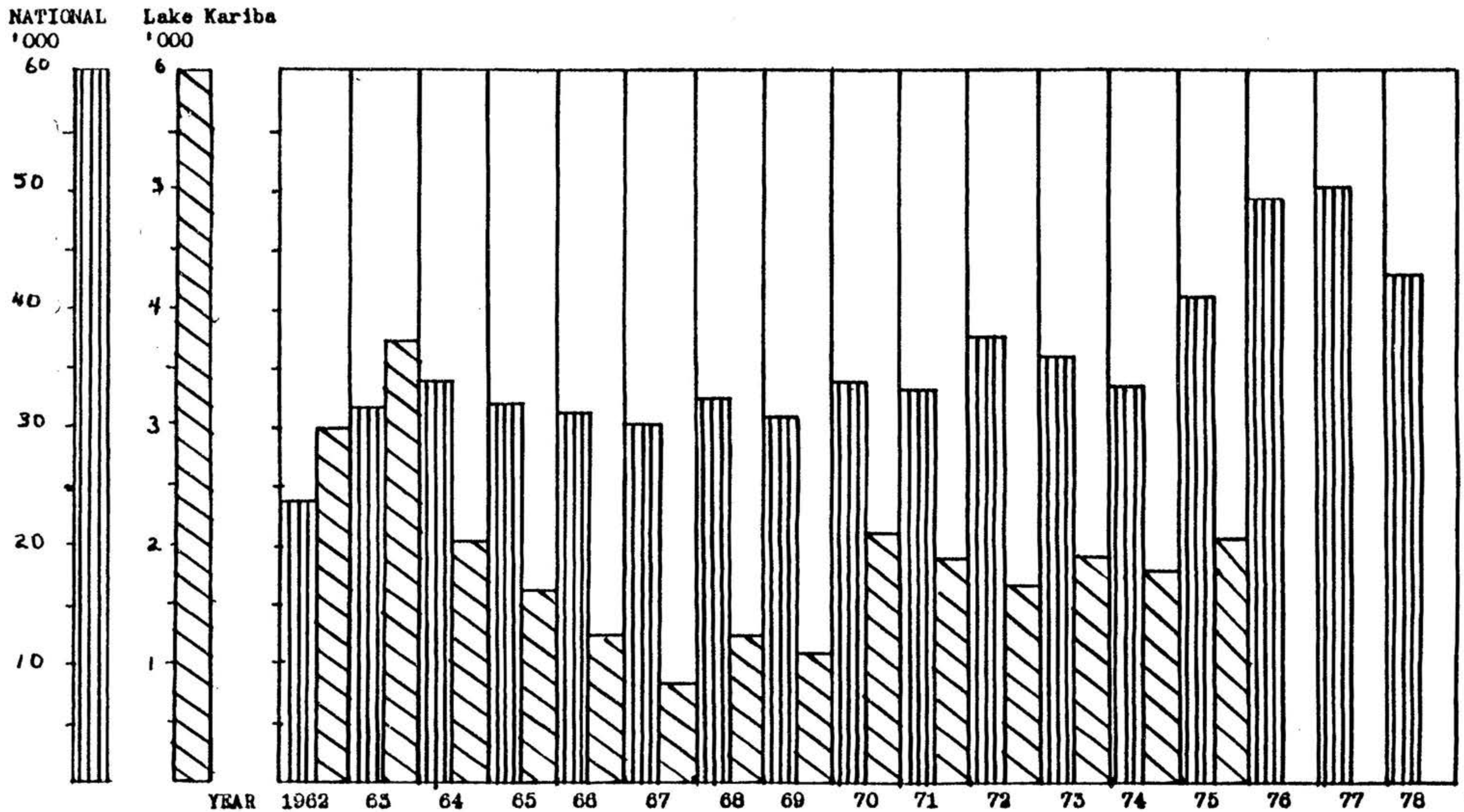
> "fishing as a respected part-time activity in which a wide range of techniques were utilised to procure fish throughout the year" (*ibid*, p 42).

The issue, then, was one of introducing lacustrine fishing methods to a people who were used only to riverine techniques.

In the fisheries programme, the government borrowed heavily the experiences from Lake Bangweulu. To boost the programme, a Fisheries Training Centre was established at Sinazongwe in 1963.

In their study of the people's response to fishing in Lake Kariba, Scudder and Colson (1975) appreciate the enthusiasm that people evinced for fishing. Unfortunately, within a short time, there was a sudden slump in fishing (Figure 3:12). From 1976 onwards, fishing was completely disrupted due to the liberation wars going on in Southern Rhodesia. Scudder and Colson (*ibid*) attribute the initial decline in fishing to biological factors which could be

Fig. 3: 12 Zambia: National and Lake Kariba Fishing 1962 - 1978 (metric tons, fresh weight equivalent)



SOURCE: Based on data collected from the Monthly Digest of Statistics, Vol. VI, 12, (1970); Vol. iv, 2 (1973); and Vol. XVI, nos. 4-9 (1980). Central Statistical Office, Lusaka.

associated with the stabilisation of the lake. Nevertheless, since the cessation of the political strife in this region and consequently the attainment of independence in Zimbabwe, in 1980, fishing activities on the Lake Kariba have resumed; but the involvement of the local Gwembe people in fishing seems to be very limited. During the field trips for this study in 1983, March to September, and in 1984, June to September, it was mostly observed that most of the fishing was in the hands of big commercial fishermen. In Gwembe South, all the twelve fishing rigs in 1983 were owned by South African fishermen. Consequently, the fish caught all tend to be destined for the urban areas.

Apart from fishing, agriculture was also seen as an activity in which people could make a living. Cotton had already been suggested. People responded, but here they met an obvious constraint in the limited land resource. This was exacerbated by the high human and livestock population. The situation can easily be comprehended in that, whilst 34,000 people were resettled in the whole valley during the resettlement episode in the early 60's (Colson, 1971), in 1979 there were 36,293 people in Gwembe South region alone (Tables 3:3; 3:4).

Despite the limitations in land resource, cotton production has tended to be the predominant agricultural activity. This phenomenon is vividly demonstrated in Table 3:5, which shows the number of farmers and hectarage under cotton production in each village within the Buleya Malima Agricultural Camp. Table 3:6 shows the marketable intake of cotton in 1982/3 season from other camps in Gwembe South.

These statistical data do indicate the pattern of land use system that one finds in Gwembe Valley today. They demonstrate the limitations

Table 3:3 Gwembe South Population Classified by Sex and Age Groups, 1969.

Polling District	Sex M-Male F-Female	Age Group (Years)			Not Stated	Total
		0-14	15-49	50+		
Siampondo	M	527	247	98	0	872
	F	554	496	113	1	1,164
Siameja	M	654	409	48	0	1,111
	F	675	696	44	2	1,417
Dingeza	M	259	197	37	4	497
	F	285	262	50	3	600
Siatwiinda	M	617	347	94	2	1,060
South	F	651	621	76	1	1,349
Siatwiinda	M	715	501	121	92	1,429
North	F	755	809	163	103	1,830
Kanchindu	M	551	324	68	20	963
South	F	523	452	97	21	1,093
Maamba	M	944	1,443	94	11	2,492
	F	866	929	36	15	1,846
Kanchindu	M	769	447	105	5	1,326
North	F	727	795	109	5	1,636
Nkandabwe	M	507	387	47	6	947
North	F	545	494	50	5	1,094
Nkandabwe	M	547	314	87	1	949
South	F	588	515	83	2	1,188
Sinazongwe	M	583	546	63	5	1,197
	F	658	523	30	3	1,214
Nangombe	M	396	223	49	4	672
East	F	391	359	50	12	812
Nangombe	M	588	324	112	0	1,024
West	F	533	517	107	0	1,157
Malima	M	569	503	76	76	1,224
South	F	603	626	83	81	1,393
Upper	M	728	394	102	4	1,228
Malima	F	758	674	73	4	1,509
Total		18,066	15,374	2,365	488	36,293
As per Cent of Total		49.7	42.3	6.5	1.3	

Source: Zambia, Republic of (1975): Census of Population and Housing, 1969, Final Report, Vol. IV (G2). Gwembe District. Central Statistical Office, Lusaka.

Table 3:4 Livestock Population in Gwembe South, 1981.

Category	Mwemba	Sinazongwe	Total
a. Cattle:			
Bulls	433	203	636
Cows and heifers	7,456	8,697	16,153
Oxen tollies	2,758	2,631	5,389
Calves	2,041	3,030	5,071
Total	12,688	14,561	27,249
b. Small livestock:			
Sheep	52	4,433	4,485
Goats	2,804	3,971	6,775
Pigs	1,418	861	2,279
Total	4,274	9,265	13,539
c. Poultry	9,530		

Source: Department of Veterinary and Tsetse Control Services, 'Statements of Animal Populations and Diptanks', 1981, Choma.

Table 3:5 Total number of farmers cultivating cotton at Buleya Malima Agricultural Camp, 1982/83 Season.

Village	Number of Farmers	Hectares (Total)
Sikaputa	74	60
Siamunyembe	39	39
Siamafunde	39	48
Chaande	40	42
Muntuwamasiku	88	100
Muzambalika	25	30
Ntobonte	26	26
Lusinga	33	34
Simagwali	7	7
Siansima	22	46
Siazwela	22	20
Total	415	452

Source: Data extracted from the records of the Buleya Malima L.I.N.T.C.O. Extension Office, August 1983.

Table 3:6 Total weight of cotton marketed at each Agricultural Camp in Gwembe South, 1982/83 Marketing Season

Camp	Intake (kg.)
Siatwiinda	29,675
Sulwegonde	3,407
Maamba	2,096
Mwezya	29,113
Siamuleya	95,656
Buleya Malima	57,342
Sinamalima	319,789
Chiyabi	18,674
Mwananjoke	47,848
Total	603,600*

Note: *As up to August 1983. Some camps were still receiving cotton from farmers.

Source: Data extracted from L.I.N.T.C.O. Cotton Intake Statistics kept at Sinazeze, L.I.N.T.C.O. Sub-District Office, 1983.

of land resources not only for crop production, but also the consequential conflict in land use between a purely cash crop and food crop, and also the obvious conflict between crop production as a whole and livestock rearing. In chapter four, we discuss how, under a predominant Gwembe Valley indigenous land use system, such problems as mentioned above were mitigated.

A seemingly new innovation that has been introduced to the Gwembe South region is that of smallholder irrigation; but, because of the parallels that we shall draw between this innovation and the indigenous Gwembe Valley agrarian system, we are discussing it on its own, where we even make an evaluation of its impact in this area. This is done in chapter five.

Coal Mining

Coal mining in Gwembe South region is one activity which is not very much related to Kariba Gorge damming. The Gwembe Valley coal resources were noticed in 1860 by David Livingstone, but it was only in the mid-1950's that geological surveys appraised the full extent of the deposits (Griffiths, 1969). The time-lag in appreciation of the resource was mainly due to the discovery of Wankie deposits in 1894 and their subsequent development when the railway line attained the town. Thereafter, the Wankie coal mine supplied coal to both territories.

The Zambian government only seriously considered the development of Gwembe Valley coal resources when the white settlers in Southern Rhodesia unilaterally declared independence, which Zambia opposed. The Nkandabwe coal reserves were discovered in 1965 and the following year production begain. The Maamba deposits were also discovered and the mine started producing in 1967 (Griffiths, 1968). Whilst Nkandabwe mine was closed in 1969, Maamba seems to have a potential for production up to the end of the century.

The development of coal mining in Gwembe Valley has resulted in Maamba Colliery town becoming the most densely populated part of the valley (Table 3:3). Moreover, apart from the provision of some employment opportunities to people (Griffiths, 1968), it has also boosted the infrastructural network (Elgie, 1975). Although Maamba is only 80 kilometres (50 miles) by road from the railway line at Choma, via Masuku Mission, the steep gradient of the escarpment meant that the main road serving the industry had to pass along the valley floor, lengthening the distance by about 48 kilometres (30 miles) (Griffiths, 1968, and Figure 3:10).

Summary and Conclusion

In this chapter, an attempt has been made to show that, in the pre-colonial period, the Gwembe Tonga were one of Central Africa's prosperous communities. The decline of their economy has been traced much further back, before the imposition of the colonial administration. Colonial policies have been shown to have exacerbated an already disturbed economic system.

The focus on Gwembe Valley has shown that the precarious nature of the Gwembe Tonga agrarian system was present much earlier than was hitherto appreciated. Nevertheless, the system was compatible with the local socio-economic conditions. Its development seems to have been more recently thwarted by the desire to realise the hydro-electric potentials of the Kariba Gorge.

The compensatory activities, under the resettlement programme, have been shown not to have realised the desired objectives. Fishing was short-lived and cotton production, though popular, can hardly be accounted a regional success. We can thus conclude that both the euphoria that preceded the Kariba Dam construction and the envisaged economic activities in the resettlement programme have all [illegible] deterioration in the socio-ecological conditions of the Gwembe Tonga. Incidentally, the people seem to have developed their own coping systems to the new environment. This phenomenon is seen by Scudder and Colson (1979) as an adaptation of their pre-damming long-evolved techniques. Before we proceed with the discussion on the adaptation of indigenous technology to the new system, we need to understand this indigenous technology in the first instance. This is the theme of our next discussion.

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CHAPTER FOUR

The Gwembe Valley Land-Use System:

Virtues and Weaknesses based on experiences before resettlement (1960)

Introduction

The Gwembe Valley TraditionalLand-Use System, hereafter called Gwembe Agrarian Systems, is only referred to in this way in the Zambian context (Scudder, 1962; Allan, 1965; Hellen, 1968; Schultz, 1976). This Agrarian System is a common practice in other riverine based societies of Tropical Africa (Morgan, 1969; Gleave and White, 1972). It has been observed in the Lower Shire Valley of Malawi (Morgan, 1952). Some of its characteristics have been traced in the land-use practices of the Sonjo people of Tanganyika (now Tanzania) (Gray, 1963). And it is widely used in some of the West African societies (Harlan and Pasquerau, 1969; Bradley et al, 1977). Although we shall draw from some of these sources, we are here mainly describing it only in light of the Gwembe Tonga's experiences in the first half of this century.

A Description of the Gwembe Agrarian System

The earliest detailed description of the Gwembe Agrarian System was made by Trapnell and Clothier (1957). Later, Colson (1960) and Scudder (1962) analysed it from sociological and ecological viewpoints, respectively. However, in our reconstruction of the Gwembe Agrarian System we shall take note of the cautions of Colson (1966) and Scudder (1976) that this system should neither be seen as if it was temporarily static nor spatially constant. In fact, our present endeavour is precisely to exemplify the dynamism and variety of indigenous land-use systems.

Trapnell and Clothier (1957) saw the agricultural system in use in Gwembe Valley as having two main components. On one hand, it was like other Tropical African agrarian systems, which were essentially dependent on fallow rotation of cropping areas and on seasonal rainfall. And, on the other, it allowed the cultivation of the floodplains of the Zambezi. The symbiotic relationship between these cultivation patterns formed the distinctive feature of the Gwembe Agrarian System, as compared to other agrarian systems based entirely on the higher grounds (Allan, 1965; Hellen, 1968; Schultz, 1976).

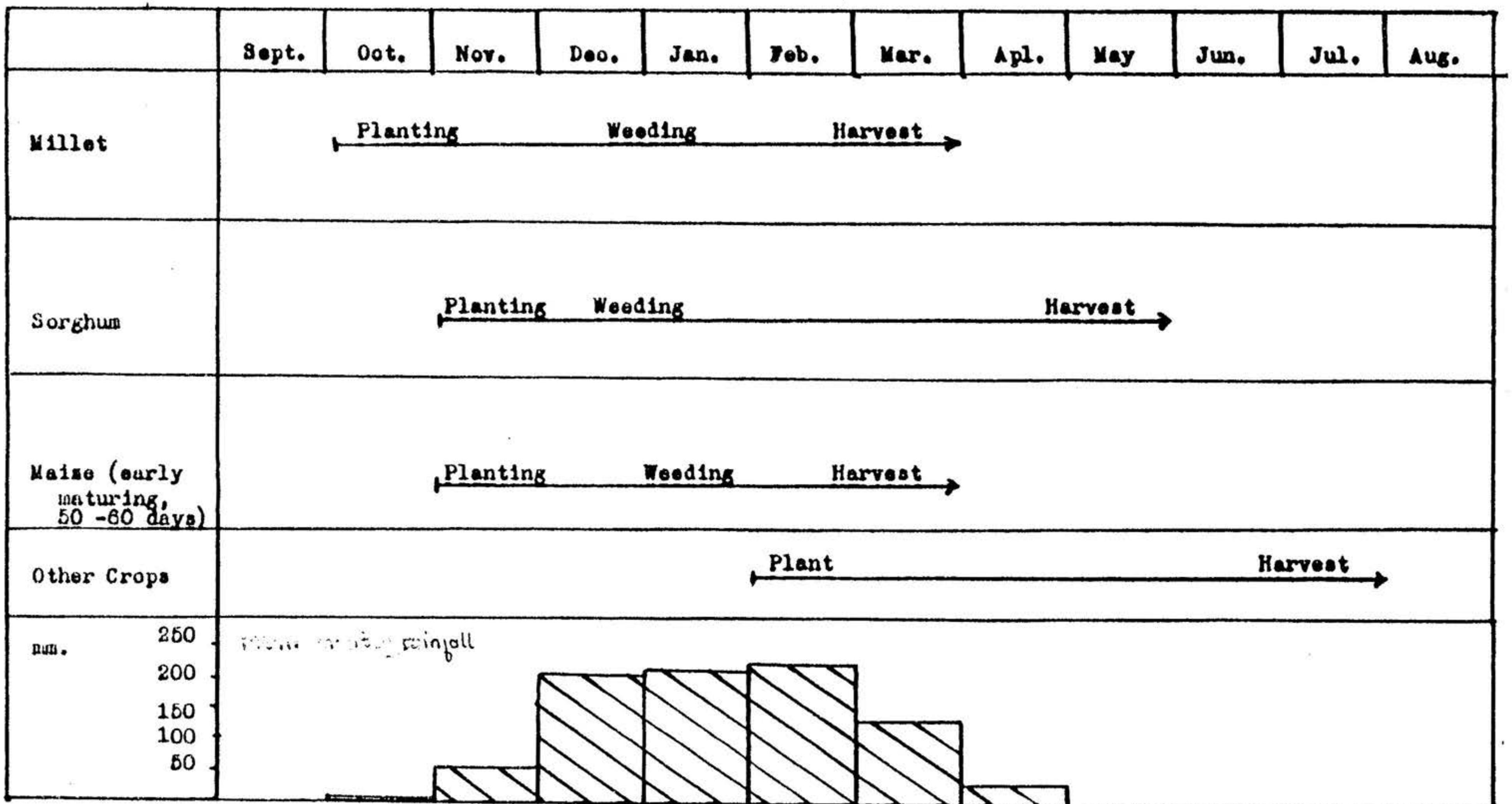
Rotational Fallow Cultivation

At the time of the Trapnell and Clothier surveys, from 1932 to 1934, the Gwembe Tonga were seen to regard the cultivation of rainfed crops, on the upland, as the main agricultural activity. The fields were prepared and cultivated mainly in the wet season, that is from November to March. Thereafter up to some time in June, crops were harvested.

Crop Management

The crops grown were mainly sorghum and millet. However, they were individually intensified in particular ecological zones. In sandy soils marginal to Londe, sorghum was planted. And in clay soils marginal to Mupane, millet was cultivated. There were also differences in the timing of their planting and harvesting (Figure 4:1). Scudder (1962) observed that bulrush millet was planted prior to the advent of the rains. This was to ensure that the millet springs up before the weeds,

Fig. 4: 1 Sequence of Crop Cultivation Activities in Time and Season; Rainfed Crops



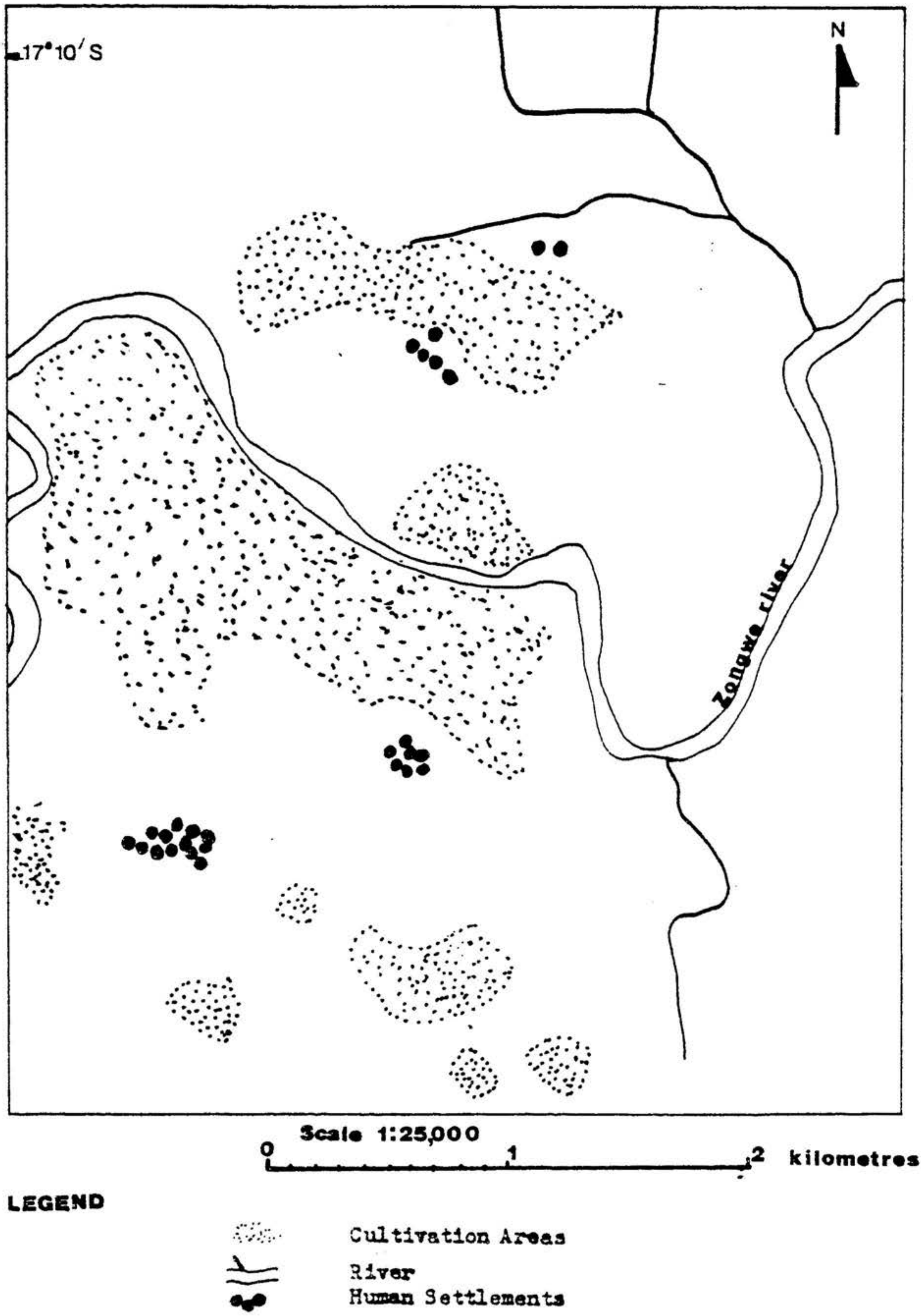
Based on Data in Table 2.]

and it reduces the possibility of plants being under 6 inches (151 mm) in height when the heavy rains set in. Maize and sorghum, however, were planted after the first heavy showers. In turn, harvesting was practised in different periods as well. Whilst millet was harvested in March, sorghum was left to ripen up to some time in May (Trapnell and Clothier, 1957). This type of crop management optimizes each crop's compatibility with particular ecological zones and it also reduces crop failure due to the intensity and spread of rainfall in each season (Trapnell and Clothier, 1957; Scudder, 1962; MacArthur, 1976).

Apart from these distinctive time phasings of particular crop activities, rotational fallowing of used land was also common. The two ecological zones identified by Trapnell and Clothier (1957) - the sandy soils marginal to Londe, and the clay soils marginal to Mupane - were categorised according to their local nomenclature and use, by Scudder (1962), as Temwa and Unda, respectively. The former were normally situated behind the settlement areas, whilst the latter were usually around the settlements, as seen on Figures 4:2, 4:5 and 4:6. Thus they were all dependent on seasonal rainfall.

Because of the quality of the soils upon which they were based, these two cultivating areas were not very fertile. However, the quality seemed to deteriorate as one moved from the river to the upland. This has also been noted in Nigeria (Wallace, 1981). Hence the Unda was relatively more fertile than the Temwa. Thus the system came to rely very much on periodic fallowing of the land so as to enable rejuvenation of fertility. Trapnell and Clothier (1957) came to the conclusion that three to four years of continuous cultivation, followed by the same

Fig. 4: 2 Cultivation Areas on a Part of Zongwe River, 1954



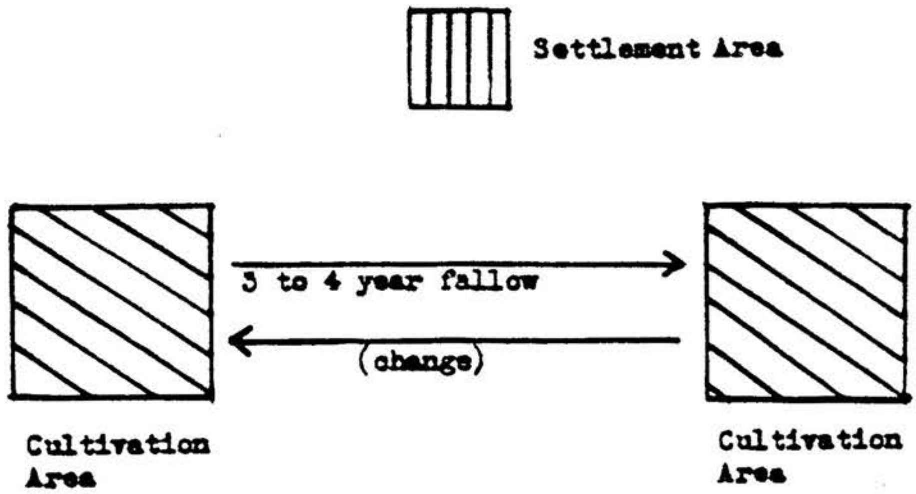
period of fallow, were essential to maintain the system. The cultivators could come back to the former land, or move to a third piece of land which they could also use for the same period. This was mostly the case in poor soils (Scudder, 1962). However, on less exhausted soils the period of cultivation could be as long as five to eight years. But a fallow of three to four years seems to have been given periodically. This is shown on Figure 4:3. The efficiency of total land utilisation in one agricultural season is calculated using the 'R' value, as already used by Baum (1976). It can clearly be seen that in less exhausted soils most of the land was used. But, in exhausted soils, much more land was needed to maintain the system: however, less land was actually used in each agricultural season.

However, Trapnell and Clothier also noted that there were instances when whole villages used to shift after exhausting a piece of land which had been in use for more than seven years. But, as in situations where they moved gardens, they also came back to their former home sites after two or three neighbouring valleys had been similarly worked. This is clearly shown in Figure 4:4, which also shows the 'R' value - that is, the efficiency (in space) of land utilisation.

However, fallow rotation technique does not seem to have been very well entrenched in the Gwembe agrarian system at the time when these surveys were being conducted. Colson (1960) and Scudder (1962) saw it as a recent phenomenon in the valley. They did not find any concrete evidence, even 20 years before their survey in 1956/7, which could indicate the predominance of its use. Their informants seem to have been unanimous that it was a recent practice in the area. From this basis, Scudder (1962) drew eight reasons which could support this contention, and these are:

Fig. 4: 3 Field Rotation; Permanent Settlements

A: Five-year Rotation and Three-year Fallow

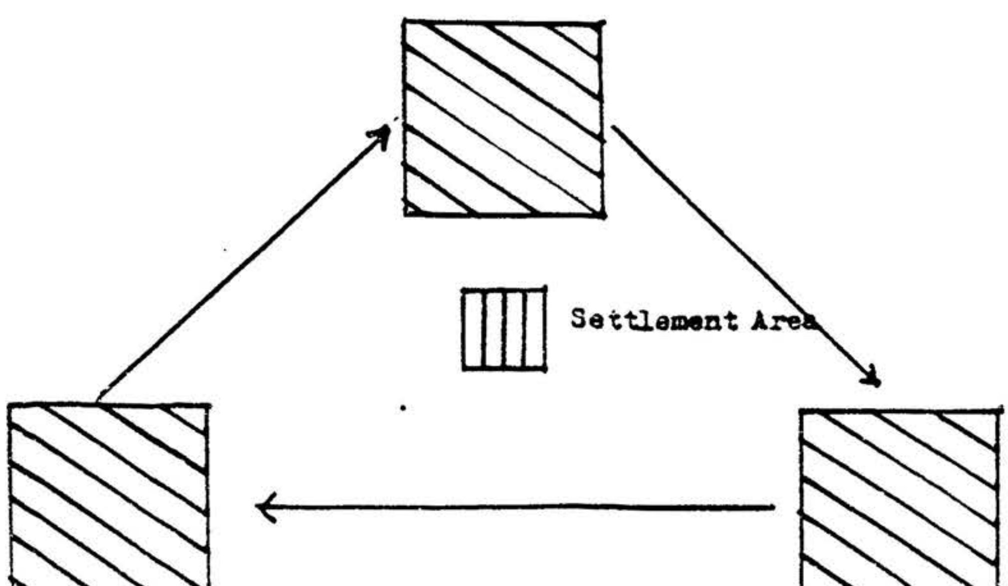


Quantitatively, the efficiency of land use is calculated using the 'R' value; where

R = Per cent of total land under cultivation
x = Period, in years, of continuous cultivation
y = Period, in years, of fallow.

Thus, R above is $\frac{x}{x+y} = \frac{5}{11}$ = 45 per cent.

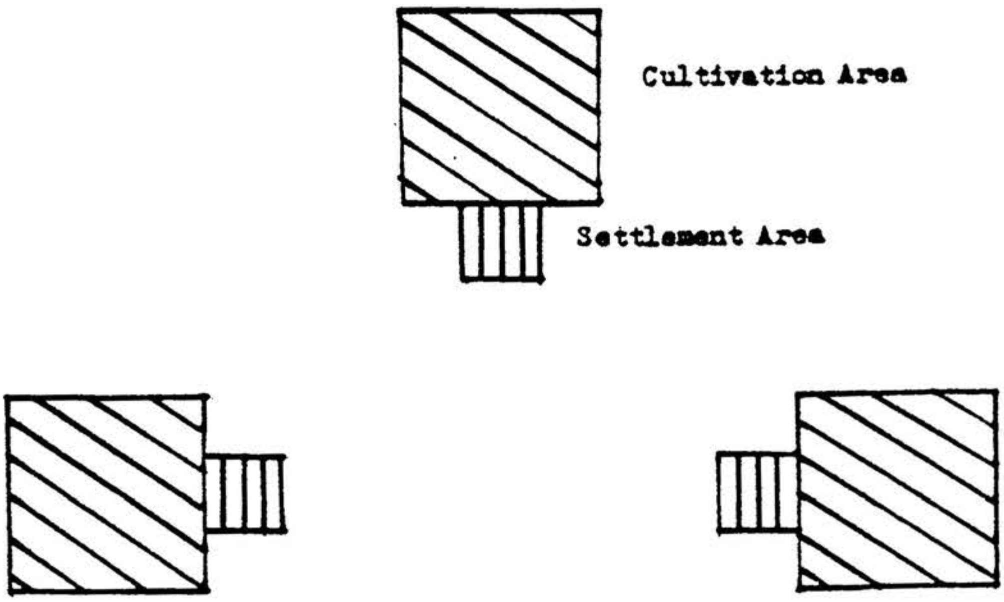
B: Three-year Cultivation and six-year Fallow



Here, $R = \frac{3}{3+6}$ = 33 per cent.

Fig. 4: 4 Field and Settlement Rotation

C: Six years of continuous Cultivation and Twelve Years of Fallow



Here, $R = \frac{6}{6+12} = 33$ per cent.

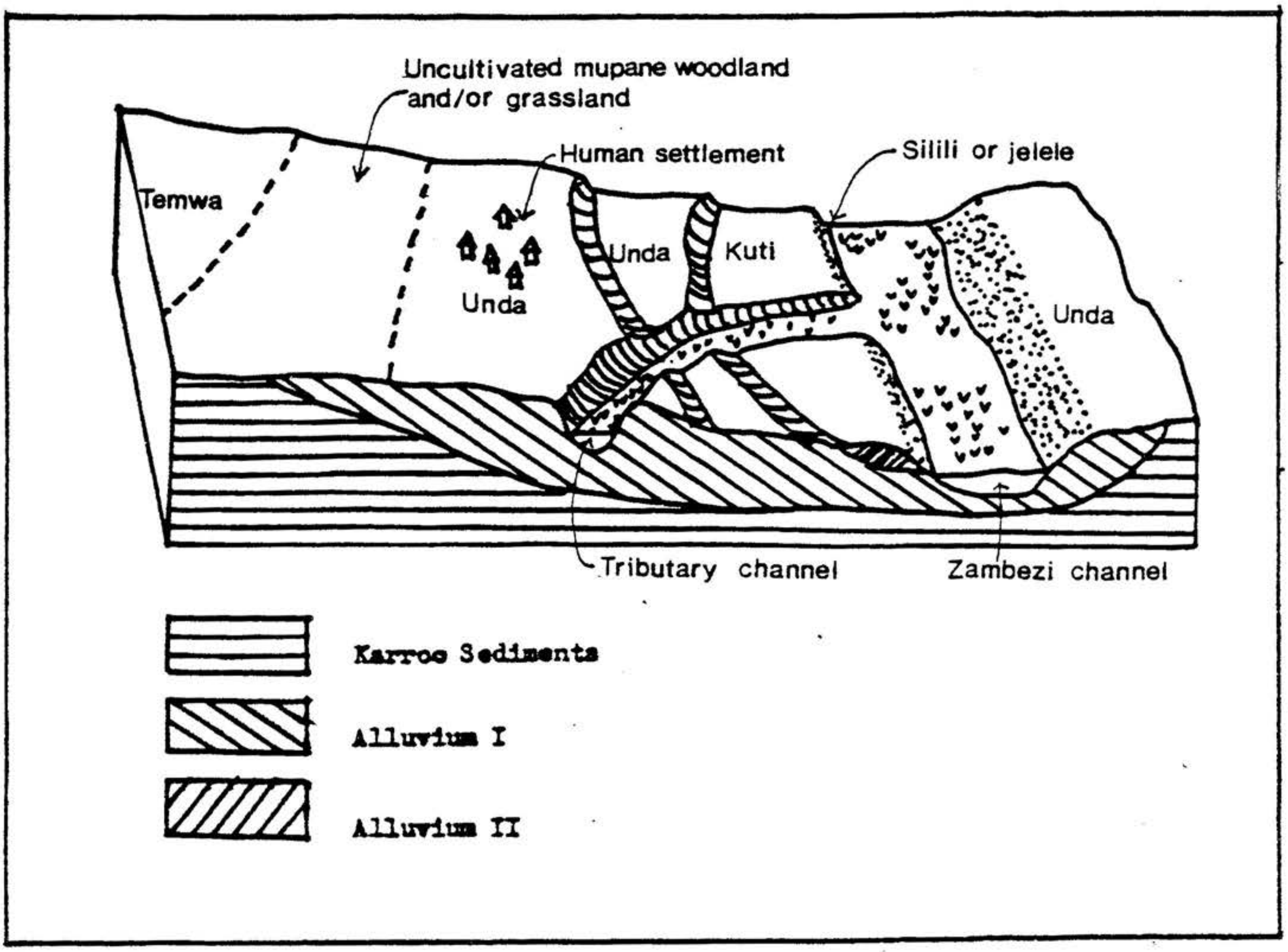
1. Free roaming of wild game (predators)
2. Raids from neighbouring tribes
3. Orientation towards the Zambezi River and its tributaries
4. Fertility of the floodplains
5. Rudimentary technology with which to open new lands
6. Water scarcity, especially towards the end of the year
7. Emigration to the plateau
8. General inertia inhibiting innovation

Most of these limitations have been mitigated over time, and especially from the late nineteenth century. Colonial incoming curtailed tribal raids. The increase in human population and the consequent opening of new grounds controlled the widespread roaming of predators. The opening of new grounds has been made easier through the introduction of the plough by the missionaries. And the emigration to the plateau, apart from those for wage employment, was discouraged due to the delimination of most of the lands along the 'line of rail' on the plateau as reserved for settler farming activities. In fact the Gwembe District was designated as an African Reserve area. Thus, the mitigation of current constraints in land-use coupled with the colonial administration influence, encouraged the Gwembe Tonga to be innovative in their appreciation of the ecological and socio-economic circumstances. Hence, Colson (1962) and Scudder (1962) concluded that the seeming predominance of the fallow cultivation system as described by Trapnell and Clothier (1957) could have been based upon the people's acceptance of the inadequacy of the floodplains to support a growing population.

Flood Plain Cultivation

In their description of the floodplain cultivation system, Trapnell and Clothier (1957) emphasised its variation both in spatial dimensions

Fig. 4: 5 Major Middle Zambezi River Gardens



Garden Types Supporting Permanent Cultivation

Silili (or jelele): Zambezi river bank gardens, cultivated primarily during the dry season.

Kuti: Annually innundated floodplain gardens, cultivated during both the rains and the dry season.

Garden Types Supporting Land Rotation Cultivation

Unda: Rain-fed gardens cultivated on rarely innundated Zambezi and tributary alluvia or on adjacent Karroo sediments.

Temwa: Rain-fed gardens on Karroo sediments further removed from the river system and more often than not separated from Unda and associated villages by an uncultivated area of infertile land.

Source: Scudder, T. (1971), p. 12.

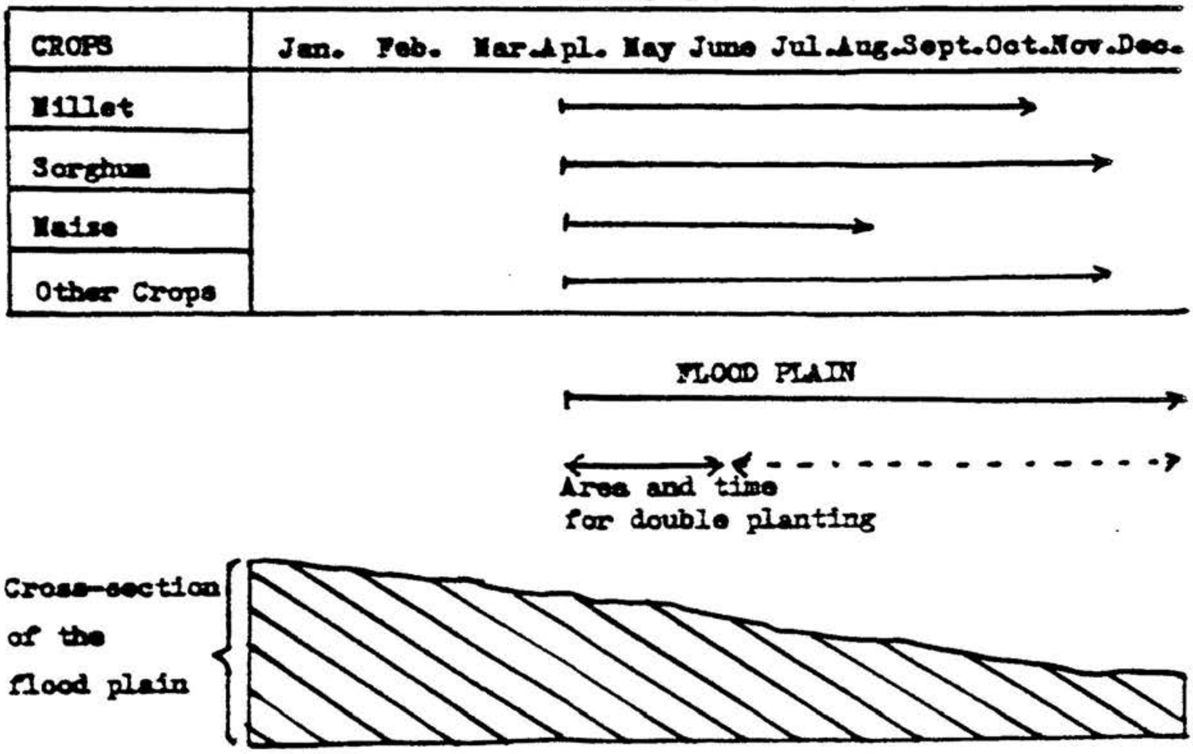
and in periods of cultural practices. The variations in space came to be categorised into cultivation zones by Scudder (1962). He saw two main zones of cultivation, and categorised them according to the local nomenclature and use, namely the jelele (commonly referred to as silili in Gwembe South: we shall adopt the term silili in this discussion), and the kuti. The major determinant of their difference is the annual variations in the river's hydrology and hence flooding.

The silili gardens are mostly situated on the edges of the rivers. And the kuti are those on somewhat higher grounds (figure 4:5). Whilst they are all subjected to flooding in times of low floods the kuti gardens do not get inundated. If this occurs, the kuti are used as the upland gardens. But in times of high floods they all get inundated. As the waters recede, crops were grown. However, the influence of the gradient of the plain comes to take its place. The areas of early recession were the first to be planted. But the whole draindown zone was not used for fear of a sudden flood in the following season of river flow.

Crop Management

Figure4:6shows the sequences of different types of crops depending on the area of cultivation, and the time of planting (and hence the periods of crop maturation). The main crops (millet, sorghum and the local maize variety kaile) were planted in the first two months of the flood recession. This was to give each crop enough time to ripen before the coming seasonal flood. Since it matures early, the maize crop was already ready for harvesting between 50 and 60 days after planting. Thus, from August, the main crops were being harvested. Second in time was millet, followed by sorghum, the harvesting of

Fig. 4: 6 Crop Production Sequences in Spatial and Seasonal Dimensions in Gwembe Valley, with reference to Décrue agriculture in Mali



LEGEND:

Cultivation period and area in the Gwembe Valley

Décrue floating rice cultivation areas in Mali

Based on Trapnell and Clothier (1957), Scudder (1962 & 1971), Colson (1960), and Harlan and Pasquereau (1969).

which was performed mainly in November. However, throughout the period some other cucurbit crops, of much shorter maturing duration, were being planted and harvested as the water receded.

This floodplain cultivation allowed certain areas to be cropped twice in a year (Figure 4:6). Areas which had a dry season crop which matured early (for example, maize) could be prepared in readiness for a wet season cultivation. However, the strip of land where this was possible was rather limited because the land further down the slope could not be cultivated for fear of early and/or sudden flooding.[1]

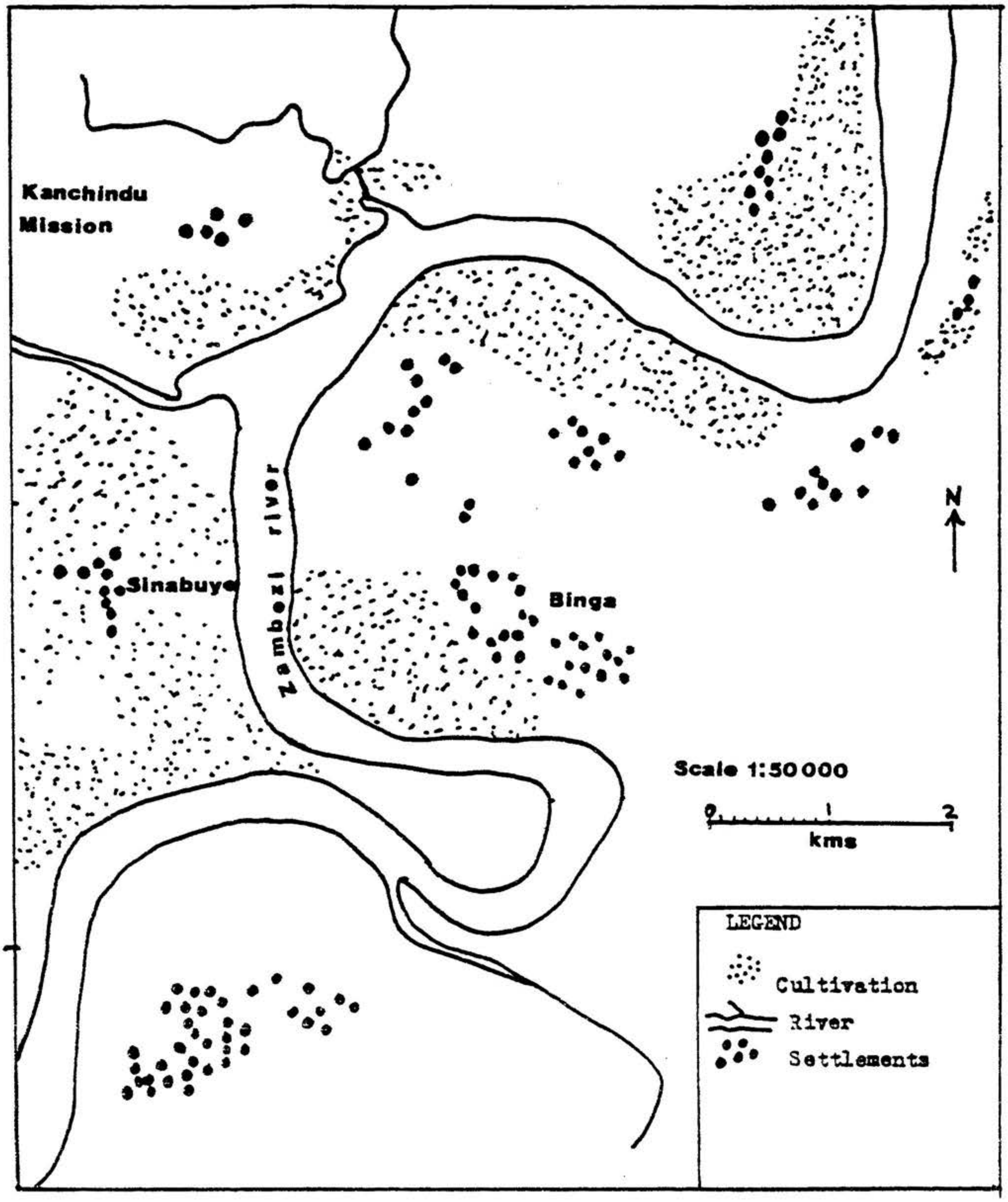
Assessment of Floodplain Cultivation in light of experiences within the Gwembe Valley and Beyond

The most important factor which allowed this pattern of cultivation of the floodplains of the Zambezi River and its tributaries was the fertility of the soils. Figures 4:2 and 4:7 show that cultivated areas were very close to the rivers, and Figure 4:5 clearly shows that these cultivating areas were based on the fertile alluvium soils, which have been seen to be of exceptional agricultural potential (as discussed in Chapter 2).

A critical look at the areas cultivated shows that the Gwembe Tonga preferred mostly those sections of the river where it meanders (see Figure 4:2 which shows cultivation areas on a part of Zongwe River, and Figure 4:7 on a part of meandering Zambezi River). This Clearly indicates that the land upon which this cultivation technique was used was itself in perpetual adjustment (Scudder, 1960). Therefore, whilst one part was being washed away, other areas were being built up, through the deposit of alluvium. Thus, even though the permanence of cultivation on particular localities has been emphasised, the

1 In comparable areas of Mali the whole recession area is used for the growing of floating rice (Harlan and Pasquereau, 1969). This issue is discussed in detail in Chapter 6 where we attempt to draw experiences from deep water (floating) rice growing areas in West AFrica and in the Asian monsoon climate areas.

Fig. 4: 7 River Meandering and Location of Cultivation, Fields, and Settlement Areas along part of the Middle Zambesi River in 1948



gradual shift of the cultivated areas has to be noted. Positive ethnological evidence to support his view is lacking, as the process cannot easily be noticed in one generation. Nevertheless, archaelogical evidence on the floodplains, which shows the historical basis of Gwembe Tonga, does provide enough support, as we have already seen in Chapter 3.

The climate in the Gwembe Valley, and the nature of the hydrology of the rivers in the area, did put a lot of strain on floodplain cultivation. Being an area subjected to very high temperatures (even as much as 32.2°C (90°F) at times (Scudder, 1960)) meant that when the water was receding rather too fast, the soils lost their moisture relatively quickly as well. This affected crops planted, immediately the water started receding.

The rainfall, as we have already seen (in Chapter 2), is very varied in storm pattern and incidence, raindrops size, and in its distribution in the area and within the season. Whereas cultivation along the Zambezi River itself did not much depend on rain falling in the Mid Zambezi Basin itself, but, in the Upper Zambezi Basin, cultivation along the Zambezi tributaries, such as the Zongwe River (figure 4:2) did depend on the local rainfall. However, due to limited rainfalls, small rivers and streams tend to dry up seasonally, as Ledger (1969) observed in West African rivers lying in similar latitudes (10-20°North). This meant that the cultivation potential of small rivers and streams was rather limited.

On the other hand, whilst the Zambezi hydrology in the Mid Zambezi Basin did not depend on local rainfall, it also meant that in times of too little rain in the valley, crops could still be grown on the edges of the Zambezi River. Indeed, during the famine of 1924, people living along the Zambezi River were cushioned from acute hunger because of their use of the floodplains inundated by water from the Upper Zambezi Basin (Gwembe District Notebook).

The Zambezi being a big river as compared to the rudimentary technological capacity of the Gwembe Tonga to harness its flow (as is common in most parts of Tropical Africa (Morgan, 1969; Ledger, 1984)) implied lack of control over the river's behaviour (flooding and recession). In fact, the behaviour of the Zambezi River was very uncertain. It seems both high and low floods were always both a curse and a boon. In times of high floods - especially if they were early - most of the dry season crop could be inundated if not harvested in time. Settlements near the river (figure 4:7) were also at times subjected to flooding. Whilst this was dreaded, it also meant that the area inundated (and hence open for drawdown cultivation) was enlarged. Indeed, this was experienced in the 1956/7 season (Gwembe District Notebook); and it has also been noticed in Mali (Harlan and Pasquereau, 1969).

Unlike the upland-based agriculture (and, of course, the agricultural practices of the plateau-based societies), the Gwembe agrarian system did distribute agricultural activities throughout the year (Morgan, 1969; Banda, 1984). This is clearly seen in figure 4:1 and figure 4:6. The virtue of it all is that it assisted the provision of food at the most acute hunger period of the year - namely the late dry and early rainy season (Colson, 1963; Morgan, 1969; Scudder, 1971; Chambers, 1983).

The most obvious limitation of this agrarian system was the increasing scarcity of the tracts of land upon which it was practised. At the time of his investigation in 1956/7, Scudder (1962) observed that the maximum silili hectarage cultivated by an adult at Mazulu village (in Chief Chipepo's area) was 0.22 hectares (0.56 acres). The minimum was a mere 0.07 acres, with the mean of the thirty-eight gardens measured at 0.23 acres. This was also seen to be the case in other villages in the valley. This contrasts sharply with the situation in 1932/4 when Trapnell and Clothier (1957) found that most fields were between a quarter acre and an acre. This clearly shows a contraction of cultivated fields, and hence their fragmentation to cope with the increase in human and livestock population.

It can thus be seen that the importance that the Gwembe Tonga attached to the upland fields, as observed by Trapnell and Clothier (1957), which came to be seen as a new phenomenon by Colson (1960) and Scudder (1962), could have been a most rational response to the environmental dictates which they could not control. In fact, in the first edition of their report in 1936, Trapnell and Clothier had already considered the resettlement of some Gwembe Tonga. Their recommendations came to be adopted in the Five Year Plan of the Southern Province, which was published in 1943 (sec 2/283). However, it was the interest of hydro-electric generation which resulted in their resettlement.

Land Tenure and Sociological Factors

Land Acquisition

The circumstances under which the system of land use changed from a predominant reliance on river or floodplain gardens to fallow rotation fields on the upland seem to have had a corresponding effect on the way in which land was being acquired and/or allocated. Whilst, in the former case, the customs of the society had a big influence on land tenure, in the latter system, the society's influence was weakened and the individual households' came to be dominant.

Before we describe the Gwembe Valley land tenure system, we need to take note of two points which are of equal importance. The first one is that the Gwembe Tonga are a matrilineal society. This means that one is most likely to inherit property from his [illegible] lineage. And, secondly, we must consider the nature of the marriage arrangements themselves. The Gwembe Tonga, although in the past they were fond of marrying within the same village (Colson, 1960) also practised virilocal and [illegible] arrangements. Depending on the circumstances under which a couple's residence is determined, their land tenure is equally affected (Mvunga, 1982). MacCormack (1983) has shown the difficulty one encounters in trying to describe unrecorded terminologies of land rights in African indigenous systems.

In their studies of the Gwembe Tonga, Colson and Scudder have emphasised that both sexes have equal rights to land ownership. In river gardens, the usual form of land acquisition was an allocation from one's own lineage. As a matrilineal society, this meant from one's mother's family. However, one could also be allocated land by her/his paternal family, as clearly shown in Table 4:1. Although this was common, it was generally not sought for as it had no security of tenure, for one could use it only during his lifetime. After death, the land would revert to his/her former lineage.

The land which one cleared through one's own efforts had the greatest security. It could be allocated to whoever the original occupier wished. However, upon death, it was treated as the occupier's estate. The dictates of the society on inheritance came to exert their influence.

As shown in Table 4:1 (derived from a census conducted by Colson during 1956 and 1957) in virilocal marriage arrangements, women received most of their river garden land (41 per cent) from their husbands. However, women could also open up new fields themselves. Yet, at this time, this could only be done in theory, as the table shows that during the time of the Colson survey only 1 per cent of the woman's river garden was derived from her own efforts. This was equally true of men. Only 4.1 per cent of their river gardens were derived from their own efforts. It can thus be seen that towards the late 1950's very few river gardens were derived from an individual's own efforts. This was certainly due to the scarcity of virgin bush in these zones (Colson, 1966).

The manner of acquisition and allocation of land just described puts a new perspective on the <u>fallow fields</u>. Since these were a relatively new agricultural practice, their user rights were themselves not yet well defined. The Colson (1962) survey of 1956/7, as shown in Table 4:1, shows that on fallow fields 76.5 per cent of men's gardens were derived from their own efforts and 78.4 per cent of women's gardens were allocated to them by their husbands. This tends to indicate the importance that the Gwembe Tonga society accorded to the two different fields. It seems that the river gardes were more tenaciously guarded by social custom. In fact, Colson (1960) observed that the Gwembe Tonga did not even seek to inherit fallowed land which could not be cultivated indefinitely. However, the increasing use of fallowed land, and the predominance of land opening by husband (with the subsequent allocation to women) came to compromise the position of women as land owners (Colson, 1960, 1966). Mvunga (1982) argues that the situation could be exacerbated by men who intentionally set out to curtail the capacity of women to acquire land.

Table 4:1 Sources of fields in Gwembe South at Chimini and Siameja villages, 1956-57.

Source	Owned by Men				Owned by Women			
	River		Fallow		River		Fallow	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Own efforts	2	(4.1)	36	(76.5)	1	(1.0)	6	(6.8)
From own father	22	(45.8)	6	(2.7)	19	(2.7)	6	(6.8)
From other paternal kin	1	(2.0)	-	(-)	-	(-)	-	(-)
From own mother	4	(8.5)	2	(4.2)	19	(19.3)	2	(2.2)
From other matrilineal kin	18	(37.5)	1	(2.1)	9	(9.1)	3	(3.4)
From other collateral kin	1	(2.0)	-	(-)	2	(2.0)	-	(-)
From spouse	-	(-)	-	(-)	41	(41.8)	69	(78.4)
From affine	-	(-)	2	(4.2)	7	(7.1)	2	(2.2)
From headman*	-	(-)	-	(-)	-	(-)	-	(-)
Total number of fields	48		47		98		88	

Note: * As a source only where he acted as headman rather than kinsman.

Source: Colson, E. 1960. p 83.

Livestock Herding

Although the Gwembe Tonga do not mainly raise livestock herds, livestock rearing is still an entrenched agricultural activity. Just as the human population increase has exerted considerable pressure in their land use system, so has their system of herding. However, the issues of importance here are the provision of grazing fields and also the safeguarding of crops from livestock wanderings.

Like any other Tropical African pastoralists, the Gwembe Tonga have paid a great deal of respect and importance to cattle owners. In any area where land for crop production is limited, the rearing of livestock is given first priority. Scudder (1962) cites a case in which a cultivator was reprimanded by the local judiciary when he complained of his neighbours' animals trespassing on his field. Mvunga (1982) observed a similar situation among the Ngoni of Eastern Province of Zambia. I also heard of a case in 1984 in which a crop cultivator committed suicide for failing to control his temper when he killed a neighbour's cow which he found tramping on his crops. Although the onus of looking after animals falls on the owner of the animals, it is up to the cultivator to keep them away from his field. The Gwembe Tonga do not seem to have resolved this conflict, but it is of the utmost importance to them.

Conclusion

In this discussion an attempt has been made to show the changing phenomenon of the Gwembe Valley Agrarian System. It has been clearly shown that in spite of the virtues of the cultivation of river gardens, the demands upon the system led to fragmentation of land and to the opening of new fields on the upland. These have required periodic fallowing to enable further use. However, in the process, and as a consequence of it, the socio-cultural values pertaining to land use have also been changed. Thus it can be seen that, even before relocation, the land use socio-economic basis of the Gwembe Tonga was already in a process of change. It remains to be seen how the resettlement intervention came to subvert or to consolidate the old order. This will be our next discussion.

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CHAPTER FIVE

The Gwembe South Development Project:

An Experiment with Smallholder Irrigation Agriculture.

An Evaluation in Retrospect

Introduction

We have seen in Chapter Three that at the time of resettlement it was envisaged that some of the people resettled would involve themselves in the fishing that the creation of the lake would allow. However, we have also shown that the first phase of the fishing industry on Lake Kariba had a very short life span. Within a few years the whole industry came to near collapse. And agricultural production, which came to involve the majority of the Gwembe people, was seen to have been based upon a diminishing arable land resource. It was concluded that, in time, this could consequently lead to fragmentation of cultivation areas and an exacerbation of the conflicts in land use between crop production and livestock rearing. Indeed, it is feared that this process is already underway.

Apart from fishing and crop production on the upland, the growing of crops under irrigation has been tried. In our present discussion, we are going to review the development of irrigation in Gwembe Valley. The case study is based on the activities of the Gwembe South Development Project (GSDP) managed under the Gossner Evangelical Mission, Technical Assistance Programme to Zambia. But before we devolve upon our subject matter, we need to define our evaluation frame of reference.

Evaluation Technique Adopted

In a review of the literature on smallholder irrigation, Barnett (1984) found that most of the evaluation techniques used concentrated purely on technological perspectives. They tended to cover a wide range of disciplines, such as economics, hydrology, soil science, agronomy, and so on. These distinctions very much reflect the frame of reference of the evaluator (Millikan and Hopgood, 1967). Barnett (ibid) also discovered that most discussions were based on case studies from large-scale schemes, in which small-scale farmers had tenancies. Indeed, it is just of late that small schemes under small-scale farmers are getting increasing attention (Blackie, 1984; Underhill, 1984). In fact, Carter and Kay (1984) have just provided a framework upon which small schemes under smallholders could be appraised. Insofar as evaluation is concerned, the existing literature does not provide an adequate technique. However, Barnett's (1976) proposition, though based on his work on the Gezira Scheme (1975a; 1975b), seems to offer the most appropriate paradigm for socio-economic evaluation of smallholder irrigation schemes. In this study we adopt this model.

Barnett (1976) makes a distinction between two socio-economic evaluation techniques, which he categorises as the 'black box' and the 'Pandora's box'. The former is the conventional and most popular model. It is based on assumptions in which inputs and predictable outputs, of a particular project or development process, are quantified. Judgements on the performance of the projects are mainly based on the efficient production of the expected outputs so as to ensure profitability of the enterprise. This model is recommended for industrial type projects (Gittinger, 1972; Austin, 1981). However, its use in evaluating smallholder farming schemes (Lele, 1975) has been seen wanting (Barnett, 1976). In fact, Hirschmann (1967) calls for caution in its use in underdeveloped environments. Generally, its applicability in these areas and on the smallholder farming section, in particular, is made difficult because the people's response to the projects tend to be affected by variables which the existing conventional appraisal and evaluation techniques ignore, but which in most cases tend to be valued by the societies in question (Hirschmann, 1967; Lees, 1974; Sorbo, 1977; Palmer-Jones, 1981; Chambers, 1983).

Thus, Barnett (1976) proposed that a more appropriate paradigm could be one which attempts to be all-embracing. This is what he called the 'Pandora's box'. In this model, efforts are made to understand the whole transformation process which the process goes through. You do not just look at the profit viability of the projects but also the social relations of production that emerge and how they affect the intervention brought in. This paradigm seems to be appropriate in the evaluation of projects whose objectives tend to be obscure, such as raising the standard of living and community development (Afriyie, 1970/71; Sandford, 1973).

Background to Irrigation Development in the Gwembe Valley

As already seen in Chapter Three, irrigation prospects in the Mid Zambezi Valley were studied before hydroelectric generation interests were considered, in the area. The Zambezi River was measured for this purpose in 1914 (Anderson, n.d.). However, on the Zambian side a small dam was constructed at Mulobela River in 1914. And the Gwembe District Notebook acknowledges that the dam became "very useful during the dry season of 1914" (p.202). But the dam was not very strong. It was washed away during the heavy rains of that same year. Two other dams came to be built at Gwembe Boma, on the plateau, in 1947, but these were essentially for domestic water supply for the Boma community and not necessarily for any agricultural use.

When the hydro-electric prospects of the Kariba and Kafue gorges were being studied, irrigation prospects were also being considered. The initial gaugings of the Zambezi River revealed that the reservoir which would be created, if Kariba gorge were dammed, would have more water than would be needed for hydroelectric generation. Thus it was concluded that since the quantity of water needed for irrigation was negligible, it would be possible to keep the lake level constant so as to enable the pumping of water from the lake by small units which could be installed at all suitable places along the lakeshoreline. Prospects for irrigating downstream areas of the dam site were also studied.

Due to the sheer size of the Zambezi River, any plans for irrigation development had to be seen in large-scale perspective. Unlike hydroelectric generation, which could be considered alone, irrigation development was one of the activities under the proposed Zambezi Valley Authority (Z.V.A.). The agenda which was drawn up for the 'International Conference on Zambezi Water Rights' in 1948 was very explicit on this point. In item 2.II it stated:

'As a matter of urgency (the conference had)
to review the proposals to construct a large dam at the Kariba Gorge for the generation of Electric Power to supply Northern and Southern Rhodesia and for the irrigation of lands for the production of food and other crops.'

(Bracket inserted and emphasis mine) [SEC 3/618]

However, as we have already seen, during September of 1948, telegrams were exchanged between the two governments which undermined any immediate consideration of the Z.V.A., with far-reaching consequences. Attention came to be focussed mainly on finding suitable sites for hydro-electric power generation. Thus, the H.E.P. Commission omitted consideration of irrigation development in their studies. Nevertheless, they advised that:

'from a purely engineering aspect, the Kariba works would lend themselves to any form of irrigation requirements on both banks of the Zambezi.'

[SEC 1/225]

This advice was completely ignored by the report published by the Federal Government on the Kariba Project. It was plainly said therein that there were NO immediate possibilities of irrigation along the Lake Kariba shoreline.

Feasibility Studies and Proposals

Despite the negative view of the Federal Government, towards irrigation in Lake Kariba Basin, it seems the Northern Rhodesian government was still keen. Of course, the assignment of roles had stated that resettlement was going to be a territorial concern (Colson, 1971). Immediately after the resettlement episode in 1961, the Northern Rhodesian government commissioned a private consulting firm, Robert, Mullins and Barnett of Southern Rhodesia, to carry out a feasibility study of irrigation prospects in the Buleya Malima area (figure 5:1), which was one of the densely populated resettlement areas (Colson, 1971). The consultants published their preliminary findings in 1961 (Robert, Mullins, and Barnett, 1961).

Buleya Malima Irrigation Scheme

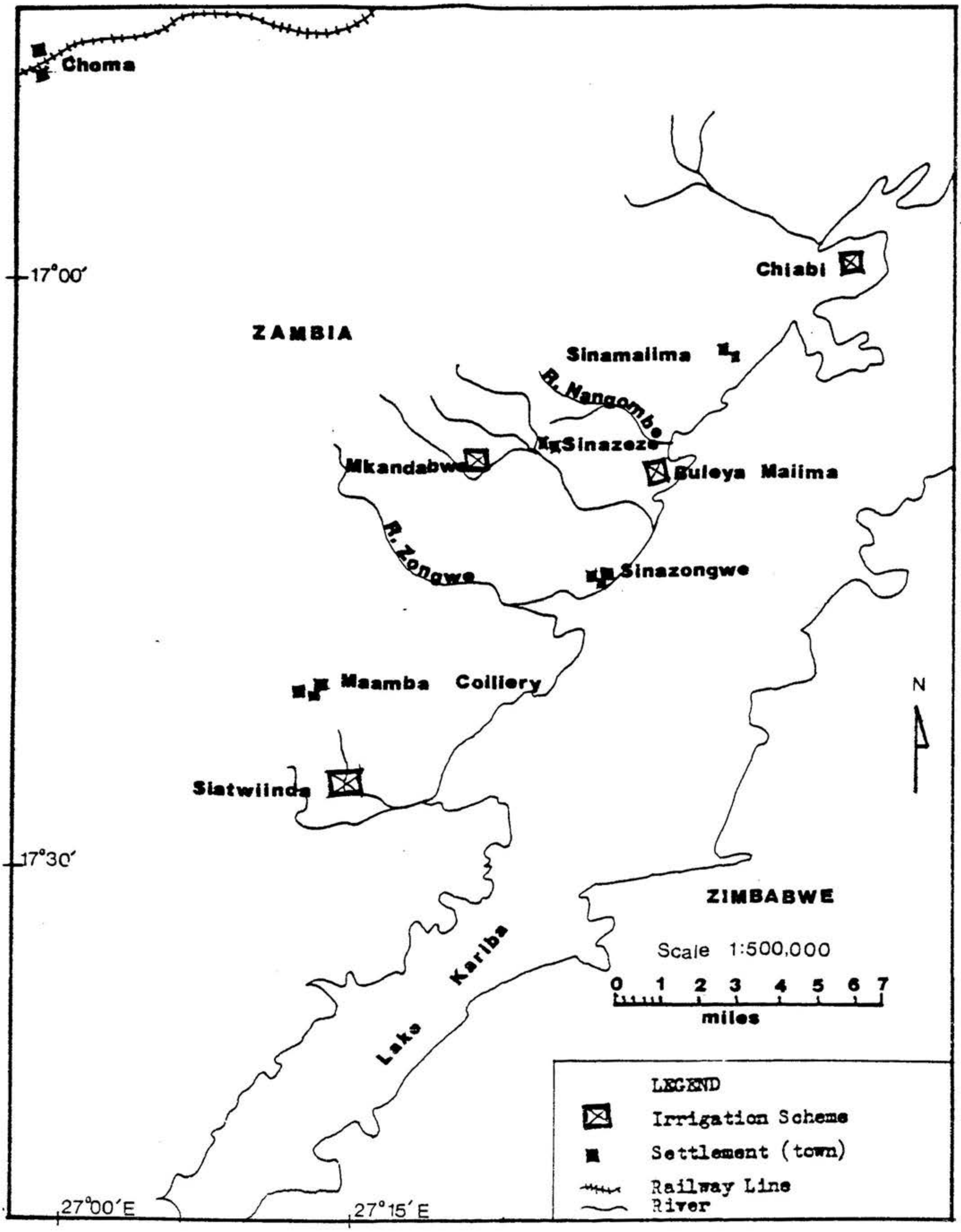
In their Report, the consulting firm clearly pointed out the main objectives of the scheme they were considering were to compensate the relocatees for the loss of land inundated by the lake and, in the process, to raise the standard of living of the people involved. They identified three possible forms of irrigation development that could be promoted:

1. Development of Lake Kariba tributaries
2. Drawdown area irrigation
3. Pump irrigation from Lake Kariba

At Buleya Malima, the Nangombe River was an obvious proposition for the development of Lake Kariba tributaries. It was, in fact, seen to have a better regime than most rivers in the valley (Figure 2:3 Chapter 2). But before it could be used, it needed to have reservoir facilities; that is, a dam was needed. Once dammed, the area to be irrigated could be about 600 hectares (1500 acres). However, the high rate of siltation of rivers in the valley, as discussed by Bolton (1984), led the consultants to discourage such development.

The consultants also noted that the presence of large tracts of land, along the lakeshoreline (which was going to be subjected to annual inundation) led logically to a consideration of cheap forms

Fig. 5: 1 Location of Smallholder Irrigation Schemes in Gwembe South



of irrigation. Yet, they felt that the area could present special problems, especially between the lake behaviour (fluctuations) and the timing of crop cultivation activities. They were of the view that dry season cultivation could not be practised because most of the tracts of land would be inundated during this time. The land fringe exposed by receding water from June onwards was also seen to be risky. There was a likelihood of inundation of crops whenever there was sudden flooding. Thus, they recommended the establishment of schemes which were going to rely on pumping of water from the lake.

The consultants saw the Buleya Malima area as offering the most feasible site for the type of irrigation scheme envisaged. It did not require any special consideration as far as the lake regulation was concerned. They, therefore, decided to set the pumping units at the level where normal lake fluctuations would not affect water pumping.

Since the lake level was seen to vary over a maximum of 13.72 metres (that is, between reservoir levels at 475.48 and 489.20 metres above sea level) they calculated that the area subject to seasonal flooding at Buleya Malima was going to be as much as 3.2 Km in places. The lowest reservoir level of 475.48 metres, A.s.l. was projected to occur only once in 16 years, and then for only a period of one to two months. This was to be expected mostly towards the end of the dry season and the start of the new rainy season. This is the time that water is not supposed to be pumped, as the plots on the scheme are being prepared for a rainfed crop. Thus, the demands on irrigated water are at their minimum.

For these reasons, it was decided that the scheme did not need to be designed for such extreme conditions. They therefore set the lowest level of pumping at a lake level of 477.01 metres A.s.l. or 1.53 metres above the expected lowest level of the lake. The average lake level for normal pumping was seen to be 478.53 metres above sea level.

The Buleya Malima Irrigation Scheme was initially to cover about 3440 ha. (1400 acres). Out of this, about 323.7 ha. (130 acres) were to be set aside for villages, roads, canals, drains and other physical structures. The cultivatable area was thus going to be 3116 ha. (1260 acres). Unfortunately, to execute the project some villages had to be resettled to higher ground. Nevertheless, they were to be settled as near as possible to their plots on the scheme. The size of the holdings to be allocated was to be 2.42 ha per average family, but there were also to be small holdings for smaller and poorer families.

The consultants emphasised that the success of the project was going to depend on two factors. The adoption of irrigation management techniques by the farmers, in the scheme, was singled out as of significant importance. However, this had to be augmented by the provison and availability of support services, like loans, marketing facilities, appropriate training, and so on. Before the scheme was put into full execution, they recommended an experimental phase, in which the following factors were going to be studied:

1. Identification of the most suitable crop(s)
2. Water requirements of such crops as related to rainfall, evaporation, etc.

3. The relative merits of different systems of irrigation application, e.g. border system, ridge and farrow.

4. The optimum length, width and gradient of individual fields of field farrows.

5. Soil moisture, and plant relationships to determine frequencies and rates of application within the figure of 2 above.

Further research on drawdown irrigation prospects was also proposed. As far as training of farmers was concerned, they felt that the experimental phase and plot had to serve as a basis for farmer training.

It took almost a decade for this proposal to be considered by the new Zambian government. In the project document prepared by the Land Use Services of the Ministry of Rural Development (Zambia, 1969), the government seem to have accepted the advice of the consultants, but they came to define distinctive execution phases of the project in which tasks were clearly assigned to implementation agencies, as follows:

Phase 1: This phase was going to last for a period of one to two years. During this period the Research Branch of the Ministry of Rural Development was going to conduct crop cultivation trials on various types of crops. Soil analysis was also to be an integral part of the trials. The research activities were to be initiated before the onset of the 1970 dry season.

A Buleya Malima Technical Advisory Committee was to be formed. Its function was to advise the management of the scheme on all aspects of crop production and scheme evaluation. The committee was to consist of officers from the Reasearch Branch, Department of Agriculture Extension Services, Land Use Branch, Water Affairs Department and the Projects Division of the Ministry of Rural Development. The Projects Division was to be the execution agency.

Phase 2: During this phase the trial site was to be expanded to include an additional area of some 80 hectares (200 acres). People occupying this area were to be resettled and allocated plots in the scheme. Training of farmers was to start right away. Priority was to be given to people in whose land the scheme lay. Initially, the plots had to be 0.8 ha. each.

To start with cultivators were to pay water-pumping costs and also interest charges on the capital invested, in the scheme, by the government. These charges were to be determined at the end of Phase 1. (However, the document did not consider revenue in terms of water charges and sale of produce in the pilot/trial/plot. Neither did it discuss the expected income to be accrued by the participating farmers.)

Phase 3: In this phase the experiences of the first two phases were to be consolidated. The area of cultivation ws to be extended to reach a maximum of <u>5665 hectares</u>. The size of plot holdings was to be maintained at 0.8 ha. each. Thus, the scheme was going to have about 7080 plot holdings.

The 'Brandt Report' and Regional Development

Before the Buleya Malima experiment got underway, the Gossner Evangelical Mission of West Germany got involved in community development activities in the Gwembe Valley. In 1970, they requested the Germany Development Institute to draw up a comprehensive plan of 'integrated intensive rural development in the Gwembe Valley'. The following year the Zambian Government endorsed the GDI consultancy.

The GDI report (commonly referred to in Zambia as the '<u>Brandt Report</u>', identified twenty-three programmes to be implemented in the first five years of the Gossner Mission-Government of the Republic of Zambia (GM-GRZ) agreement period (1970-75). The execution was to fall into the Second National Development Plan period (1972-76). The activities proposed were mainly on agricultural development, both dryland cultivation and under irrigation, fishing on the lake, and activities related to community development.

In the assessment of priority areas, Brandt singled out the generation of cash income (outside the coal mining sector) as of ultimate importance. To promote cash incomes, the report identified three areas in which the Gossner Mission could intervene. These were promotion of products which could be exported from the valley, reducing the importation of goods from outside, and strengthening the socio-economic base of the Gwembe community in general.

<u>Regional Exports</u> Activities under this sector were mainly to be on cash crop production, livestock improvement, and the promotion of fishing by the Gwembe people themselves. This was emphasised because, after the attainment of Zambian independence in 1964, there

was an influx of people from all over Zambia coming to fish on Lake Kariba. In the agricultural sector, the Report came to pay more attention to irrigation-related activities. It advised that, due to the "many unknown factors" (ibid, p.6) prevailing, dryland agriculture in this area needed less emphasis! Nevertheless, it suggested further agronomic research on dryland agricultural practices. Thus, four out of five projects proposed had a bias towards irrigation -supported agriculture.

Inasfar as crops were concerned, the Brandt mission saw irrigated fruit growing (especially citrus fruits like oranges) as the most rewarding agricultural activity in the long-term, in view of the local climate and the abundant national market.

In the fisheries sector, Brandt saw the poor state of the transport network as the most crucial bottleneck. However, the report pointed out that the promotion of fishing was more of a Central Government concern than a regionally based development strategy. Nevertheless, it recommended the establishment of an integrated lake and road trasport system and also the involvement of the local Gwembe community in the marketing of fish.

Import Substitution Brandt made a painstaking analysis of almost all the sectors of the Gwembe economy in order to ascertain the prospects of boosting locally available resources (both goods and services). However, it was mostly in agricultural activities that the local resources would be utilised. Nevertheless, they came to see the potential of using "local loam and coal from Maamba Coal Mine" (ibid, p.20) for constructing physical infrastructure (in irrigation canals, governmenthouses, schools, etc.). The expansion of the service sector, trade, recreational services, was seen as an area where the loam and coal bricks would find a ready market.

Complementary Activities Although the Brandt Mission was requested to draw up an activity-orientated development strategy, they came to the conclusion that the pre-requisite for any meaningful development in the Gwembe Valley had to be based, first and foremost, on the development of its human resources. Thus, they proposed that the Gwembe South Development Project had to pay increasing attention to community development activities. These were to be in such fields as the promotion of primary education, adult literacy education and in preventative medicine. Most of these activities were to be under the Theological Development sector of the Mission.

Thus, Brandt's proposals envisaged a threefold development strategy, a combination of all three sectors, discussed above.

Nkandabwe Irrigation Scheme

The Nkandabwe Irrigation Scheme does not seem to have had any detailed feasibility study prior to its development. It is based on one of the small dams which were constructed during the resettlement programme (figure 5:1).

Information on these dams is very scanty, and most of them are no longer in use due to siltation, which has filled them up.

The Nkandabwe Scheme also draws water from the Nkandabwe Lake, which was formerly a coal pit until its closure in 1969 (Chapter 3).

Apart from these three irrigation schemes, which are now in operation, there is also a newly initiated pilot irrigation research project at Chiabi peninsula (figure 5:1). It is being implemented under a FAO-GRZ Technical Agreement as a small irrigation research project (Siakantu and Qasem, 1984). Since this project has just started and it is not under the GSDP, we are not discussing it in detail.

Implementation

Physical Development and Scheme Lay-out

Work on the physical structures at Buleya Malima began in 1970. However the space covered by the scheme is not as extensive as envisaged in the plans. In the final report of Robert, Mullins and Barnett, they proposed that 7,700 hectares could be cultivated under irrigation; and the Report of the Ministry of Rural Development came to almost double this figure to 5665 hectares. In effect, only 25 hectares (62 acres) were developed. Out of this, 2.8 ha. (7 acres) is being used as a government citrus orchard, therefore only 22.2 hectares (55 acres) are actually allocated to the cultivators.

Initially the plot sizes were a hectare each. These were sub-divided into three parts of 0.2 ha. for vegetable and fruit cultivation; 0.4 ha. for the cultivation of cotton, sunflower and beans; and the remaining 0.4 ha. was for the growing of green maize. In 1980 the plot sizes were reduced further to 0.2 ha. each. This is seen as the most feasible size at the level of the farmers' cropping pattern and irrigation farming expertise.

Preliminary work on the Siatwiinda Pilot Irrigation Scheme (figure 5:1) was started in 1970, but work on the physical structure lay-out was not completed until 1972. The total hectarage under the scheme is 32. The Research Branch of the Ministry of Agriculture and Water Development have a 4 ha. portion within the scheme. Thus, the cultivated hectarage is just about 28. This is, also, decreased if a consideration is made of the area covered by the drainage canals, paths, physical structures, and so on. In the final analysis, only 22 ha. is actually used for crop cultivation. Nevertheless, the scheme has a provision for extension of 80 to 100 ha. The plots in the scheme are also of 0.2 ha. each.

Since the Nkandabwe Irrigation Scheme is based on one of the old dams, there is scarcity of information on its past. The GSDP revived it in 1973. It covers only 6 ha. and its plot sizes are of 0.1 ha. each. Unlike the other two schemes which are along the Lake Kariba shoreline, where the water is drawn by engine pumps, the Nkandabwe scheme is mostly gravity-fed from the Nkandabwe River; at times, it also draws water, with the aid of an engine pump, from the former Nkandabwe coal pit.

Management and Farmer Involvement

The Siatwiinda Pilot Irrigation Scheme was the first irrigation project under the Gwembe South Development Project. Apart from being a token compensation for loss of land, to the relocatees, the scheme was from the early beginning essentially seen as a pilot scheme. This was to enable the research component of the scheme to ascertain the best crops that could be grown in the Gwembe environment under irrigation and also to assess the farmers' response to the new life that irrigation farming entailed. Thus, most of the activities under GSDP came, initially, to be centred around Siatwiinda. When the GSDP revived the Nkandabwe Irrigation Scheme in 1973, they decided to continue providing technical assistance to the scheme.

The Buleya Malima Pilot Irrigation Scheme was initiated by the Projects Division of the Ministry of Rural Development. In mid-1977 the Projects Division withdrew its services and the scheme was passed on to the Department of Agriculture. Because of GSDP's involvement with other schemes (Siatwiinda and Nkandabwe) the Department of Agriculture requested the GSDP to provide occasional mechanical assistance in the maintenance and repair of the scheme's machinery. In 1979, it was proposed at the ministerial level that GSDP should extend its technical assistance to cover all aspects of scheme activities. The GSDP assigned an Agricultural Advisor to the scheme in 1980.

The main work of the institutions (government departments and the GSDP) has been to construct the physical structures, train and advise farmers, and also to study the impact of irrigation technology in the area. As far as the physical structures are concerned, their construction costs have in the main been borne by the Zambian government. However, the Gossner Mission have also, from time to time, provided funds for capital expenditures in the schemes. Table 5:1 shows the financial investments incurred by them. However, the table does not show the costs of government supporting staff nor those of the advisors under the Gossner Mission.

As far as training of farmers is concerned, the GSDP assigns profesional agricultural officers to the schemes. They are assisted by Agricultural Extension Officers of the Department of Agriculture. The farmers receive their training as soon as they are allocated plots. Apart from field level training some farmers also attend intensive periodic courses at Sina Malima Farmers' Training Centre, which is situated near Buleya Malima Irrigation Scheme. Farmers

Table 5:1 Capital Investments[a] in Buleya Malima and Siatwiinda Pilot Irrigation Schemes, 1970-1980 (in Zambian Kwacha)

Financial Year	Buleya Malima[b,i]	Siatwiinda[ii]
1970	50,000	
1971	70,000	
1972	63,000	10,128
1973	60,000	4,944
1974	65,000	6,550
1975	38,000	4,918
1976	35,000	3,850
1977	70,000	4,500
1978		8,000
1979		16,875
1980		22,325[c]

Notes: a. For the Zambian Kwacha equivalent exchange rate to a Sterling pound, see the note on conversions, p. xi

b. Part of the expenditure was on the government-owned orchard.

c. The Gossner Evangelical Mission contributed K 13,125.

Sources: i. Zambia, Republic of. Estimates of Revenue and Expenditure, Annual Reports 1970-77. Printed by the Government Printer, Lusaka.

ii. The Buntzel Report, p 30.

also receive specialised training on specific crops. This is especially the case at Buleya Malima where every agricultural season LINT company of Zambia stations an extension officer to advise farmers on all aspects of cotton cultivation. The cotton training is part of a package which includes loans for inputs and easy marketing and payment procedures.

However, in all the three schemes, farmers' executive committees have emerged which deal with all scheme discipline matters, but they seem to have devised different ways of plot allocation. At Buleya Malima and Nkandabwe, plots are given to households, presumably male headed, whilst at Siatwiinda, plots are allocated to individuals. There, some plots were owned by women. In the other two schemes, respondents could not show any plot as being owned by a woman, though at Buleya Malima, there is a plot which is owned by a Women's Club, whose membership is drawn mainly from the wives of government extension oficers. Table 5:2 shows the increase in the number of plot holders at Siatwiinda as from 1972 to 1982, and Table 5:3 shows the percentage proportion of female farmers at Siatwiinda as from 1978 to 1982. The other two schemes do not have records which indicate the involvement of women as plot holders.

Cropping Pattern and Yield

The cropping patterns that have been adopted in the schemes have been based on the trials that were conducted within the particular scheme, from the time of inception. When the Siatwiinda scheme was established, the research component of the scheme conducted crop trials on various kinds of crops, such as cotton, sunflower, sorghum, groundnuts, soyabeans, rice, onions, beans and even wheat. Their

Table 5:2 Number of plot-holders at Siatwiinda, 1973-1982.

Year	Male	Female	Total
1973	*	*	36
1974	*	*	36
1975	*	*	36
1976	*	*	44
1977	*	*	54
1978	47	14	61
1979	46	14	60
1980	50	16	66
1981	39	27	66
1982	50	30	80

Note: * No data

Source: These statistical data have been extracted from the projects (G.S.D.P.) and the Siatwiinda Irrigation Scheme's Monthly and Annual Reports, 1972-1982.

Table 5:3 Sex Proportional Involvement as Plot-holders at Siatwiinda Pilot Irrigation Scheme, 1975-1982 (in percentages)

Year	Male	Female
1978	77.04	22.95
1979	76.66	23.33
1980	75.75	24.24
1981	59.09	40.90
1982	62.50	37.50

Source: This statistical data is deduced from Table 5:2.

results showed that rice was, technically, the most feasible crop to be grown under irrigation; and from the farmers' experience it was seen that they appreciated the growing of vegetables, at the scheme, during the cool dry season (April to September). Upon this basis rice was adopted for cultivation, mainly in the wet season. This meant that the facilities of the scheme would in the main be for supplementary irrigation of rice and they would be used in full only in the dry season for cultivation of vegetables. Table 5:4 shows the hectarage, yields and marketed bags of rice at Siatwiinda as from 1976/77 to 1982/83 agricultural seasons.

At Buleya Malima, cotton has developed as the major crop. Like rice at Siatwiinda, it is also grown during the wet season. The scheme provides supplementary irrigation. Indeed, as we have already seen in Chapter 3, cotton production is the major thrust of the whole Buleya Malima Agricultural Camp (Table 3:5 in Chapter 3). However, sunflower is also grown (Table 5:5), but it does not compete favourably with cotton which has institutional support through its cultivation package. Sunflower lacks such support. As at Siatwiinda, vegetables are grown in the cool dry season. The Nkandabwe scheme seems to have adopted the Siawiinda model. Rice is grown in the wet season and vegetables are grown in the cool dry season.

Marketing of Produce from the Schemes

The feasibility studies, on Buleya Malima and Siatwiinda, all saw the Gwembe Valley as not offering a ready market for the produce from the schemes envisaged. The Brandt report explicitly stated that even the Maamba Mine community could not absorb all the produce from Siatwiinda alone. Therefore, under optimal production further outlets would be needed.

Table 5:4 Hectarage, Yields and Marketed Rice, at Siatwiinda Pilot Irrigation Scheme, Agricultural Seasons 1976/77 - 1982/83.

Season	Hectarage	Yields ('00 kg.)	Marketed ('00 kg.)
1976-77	2.5	96	38.4
1977-78	5.0	160	120
1978-79	5.6	256	203.2
1979-80	4.0	152	141.6
1980-81	4.2	140	124.8
1981-82	2.0	32	none
1982-83	2.3	20	none

Source: Calculated from Siatwiinda Pilot Irrigation Scheme, Monthly and Annual Reports, 1976-1983.

Table 5:5 Hectarage, yield and number of farmers on Sunflower at Buleya Malima Irrigation Scheme, 1978/79 - 1980/81

Season	1978/79	1979/80	1980/81
Hectares	11	5.5	3.3
Yield (marketed kg.)	7,268	3,509	1,950
Number of farmers	28	13	7
Average yield per ha.	660.72	638	590.9

Source: Buleya Malima Irrigation Scheme, Monthly and Annual Reports, 1978-1982.

However, in the initial years of the schemes, marketing of produce did not pose any serious problems. The cereal crops (rice, sunflower, maize, etc.) were being bought by the National Agricultural Marketing Board (NAMBOARD), a parastatal enterprise. The sunflower yield figures on Table 5:5 reflect the produce which was bought by NAMBOARD; and Table 5:6 shows the rice produce bought by NAMBOARD in the whole Gwembe Valley. The differences between Tables 5:4 and 5:6 indicate that there were other farmers or schemes producing rice, apart from Siatwiinda, presumably Nkandabwe, and also that there were other agencies, apart from NAMBOARD, who were involved in rice purchasing. Indeed, local organisations such as the Valley Self Help Promotion Society (VSP) and the Siatwiinda Credit and Savings Unions have at one time or another been involved in crop purchase from the schemes. Farmers are also free to sell their produce on their own account. And, of course, they keep part of the produce, especially of rice, for their own consumption.

As we have already seen, cotton cultivation has its own production package which includes the marketing. Every marketing season a LINTCO buying agent is stationed at Buleya Malima to buy the produce from farmers. Sunflower marketing was handled by NAMBOARD and with its withdrawal Southern Province Cooperative Marketing Union (SPCMU) has taken over its functions. However, due to the drought situation in the past three years, 1981 to 1984, rice has not been grown. Thus SPCMU has not yet handled any rice from the irrigation schemes. Sunflower is the only crop that SPCMU has been buying in the Gwembe Valley.

Among all the crops grown, in all the three schemes, it is vegetable growing, in the cool dry season, which has proven to be

Table 5:6 NAMBOARD Rice Purchases in Gwembe Valley, Marketing Season 1975/76 - 1979/80 (kilograms)

Marketing Season	Purchased (weight) ('00 kg.)
1975-76	92
1976-77	64
1977-78	70.4
1978-79	203.2
1979-80	140

Source: Department of Agriculture, Annual Reports 1975-1980. Sinazongwe Sub-District.

the most popular and, at the same time, which has posed acute problems. It was only at Siatwiinda where statistical data on vegetable production were found (Table 5:7). It can be seen from Table 5:7 that farmers came to respond positively to vegetable production. From 1977 to 1978, vegetable sales almost doubled, but they remained static between 1978 and 1979. This is being attributed to the water pumping engine breakdown during that period. When this was repaired, sales soon rose by as much as 26.22 per cent from 1979 to 1980. In 1981 they had reached their highest peak of 58,280 kilograms. Thereafter, sales have dropped again.

Even though the feasibility studies had warned of danger of not having a ready market for some of the produce, in Gwembe itself, vegetable production came to be encouraged by the existence of ZAMHORT, another parastatal enterprise. ZAMHORT used to buy vegetables from the farmers and it sold the produce in the urban areas. However, ZAMHORT was withdrawn in 1980 and its activities were not passed on to another marketing institution. Farmers now had to compete for the limited market offered by Maamba Mine town. Production declined once more as farmers failed to sell their produce.

However, Nkandabwe Scheme seems not to have been badly affected. This is mainly due to the limited size of the scheme itself and also because of its proximity (4 Km) to the main road to the 'line of rail'. The presence of a small community of government offices at Sinazeze has also provided an easily reached market. Nevertheless farmers still complain of a lack of adequate vegetable marketing. To assist the farmers, in all the schemes, the Valley Self Help Promotion Society has at times lent its lorry to transport produce to Choma, on the plateau. But, even then, the farmers still have

Table 5:7 Quantity (kg.) and Revenue (Zambian Kwacha)[a] of vegetable sales at Siatwiinda Pilot Irrigation Scheme, 1976-1982.

Year	Quantity ('000)	Revenue[b]
1977	14.166	5,254.10
1978	27.981	19,201.04
1979	28.471	10,372.40
1980	35.973	12,273.00
1981	58.280	*)) c
1982	26.369	*)

Notes: a. Zambian Kwacha exchange rate to pound Sterling during period under review (1977-82) as follows:-

1977 - K 1.360
1978 - K 1.548
1979 - K 1.665
1980 - K 1.7145
1981 - K 1.867
1982 - K 1.6525

b. Sales through ZAMHORT

c. No official marketing channel

Source: Siatwiinda Pilot Irrigation Scheme, Monthly and Annual Reports, 1977-1982.

to face the competition of peri-urban farmers who are already established in the market anyway. Thus, the farmers are now very cautious with vegetable production; and this has come to undermine the utilisation of the facilities provided by irrigation, considering that it is only in the dry season that the facilities offered by irrigation are used in full.

Upland Cultivation and Rural Works Programme

Although the Gwembe South Development Project has a bias towards the promotion of irrigation-aided crop cultivation, it has had from the very beginning a dryland farming component. This was done in conjunction with the Rural Works Programme. The whole essence of this component was that during the dry season people would be engaged in physical construction works, like road and bridge buildings, laying of water distribution channels in the scheme, and so on. And, in the rainy season, they would return to their own dryland fields to cultivate crops.

The link between them was that during the rural works programme period, people engaged would be paid part of their remuneration in cash and part in kind, in such things as agricultural requisites and tools. And in the upland cultivation period, the project's officers would follow the participants, giving them the necessary agricultural training and advice. Incidentally, the same project officers were also in charge of the rural works programme.

When this programme was initiated it was envisaged that a hundred people would be involved in each four year period of its execution. However, because of the drought of the early 1970's, the programme was postponed. It was only when the Gossner Mission-Zambian Agreement was extended in 1976 that the programme was started. In the first year of this scheme, forty people were enlisted, and twenty more joined in 1977. Assistance to these sixty people ceased in 1979 and a new group of another sixty people was created.

However, the GSDP reports from 1981 onwards show a shift of focus of the dryland programme from specifically working with only those people involved in the rural works programme to encompass all inhabitants of villages where people engaged in the rural works programme were coming from. The weakening of the links between the two, in effect, meant women could also be involved, whereas in the earlier period it was entirely dominated by men, who could be engaged in physical construction works. In 1982, 45 per cent of the participants in the dryland works programme were women.

Livestock

In spite of the importance of livestock in the traditional economy of the Gwembe Tonga, the Gwembe South Development Project has not been involved in any significant livestock development programme. They tried a pig project in Chief Mwembe's area in 1978 but it was soon discontinued because it relied to a very large extent on imported feed. However, the neglect of livestock consideration has come to exacerbate the problem of scarcity of grazing land. The main thrust in the irrigation schemes has been to have a double crop in each year. Thus, the animals have to be kept away, as much as possible, unlike on the upland where they are allowed to feed on the cereal stalks. However, most of the land is being put under cotton cultivation. At Siatwiinda the scheme is also being extended, limiting grazing fields further.

Community Development Projects

The GSDP has been involved in a number of community development projects. For instance, it has at one time or another been involved in nutrition and public health activities; promotion of women's clubs; promotion of adult literacy campaigns; improvement of village water supply; and so on. And it has also acted as a catalyst for the establishment of local non-governmental organisations, like the Valley Self Help Promotion Society, Gwembe South Builders Cooperative and the formation of savings and credit unions in the area. We shall not discuss all these activities in detail here. Some of them are the subject of our later discussion. However, we shall single out the activities of the savings and credit unions because of their strong links with the activities in the irrigation schemes.

Savings and Credit Unions

During the first initial years of the existence of GSDP and the establishment of the Siatwiinda Pilot Irrigation Scheme it became apparent that without credit facilities farmers were going to find it difficult to utilise the facilities offered in the scheme. This issue seems not to have been felt at Buleya Malima where the prime crop, cotton, had its own package which included credit provisions.

The study group of the Siatwiinda Savings and Credit Union (SSCU) was formed in 1977. It came to be registered as a union the following year. Apart from promoting savings and providing credit for its members, the union has been involved in other agricultural-related activities as well. Indeed, as we have already seen, the union did at times act as a middle-agent between the scheme and NAMBOARD in the marketing of rice. It also provides fishing and domestic need loans. Table 5:8

Table 5:8 Siatwiinda Self-Help Savings and Credit Union Activities, 1977-83 (Amounts in Zambian Kwacha)[a]

	1977	1978	1979	1980	1981	1982	1983 (June)
Number of members	32	88	104	151	190	207	218
Number of female workers	4	9	17	36	43	48	54
Share capital	635.33	3141.66	5159.02	9042.04	10462.33	10029.98	9927.73
Number of loans given out (amount)	*	12 (1034.00)	11 (1297.80)	20 (2216.00)	32 (3015.60)	41 (6251.80)	(6017.10)
Number of agricultural loans (amount)	*	12 (1034.00)	11 (1297.80)	17 (1966.00)	28 (2759.60)	31 (2751.80)	*
Number of fishing loans (amount)	*	*	*	2 (150.00)	3 (156.00)	5 (930.00)	*
Number of domestic loans (amount)	*	*	*	1 (100.00)	1 (100.00)	5 (245.00)	*

Note: a. For the Zambian Kwacha equivalent exchange rate to a Sterling pound, see note on conversions, p xi

* No data

Source: Statistical data provided by the G.S.D.P. Co-operative Officer, Siatwiinda, 1983.

shows the diversified nature of the activities of this union from 1977 to 1983.

When this union was formed, its membership was largely drawn from people with plots in the Siatwiinda Pilot Irrigation Scheme. This policy later changed. The membership is now open to all people residing in and around Siatwiinda village. Government officers, teachers and extension officers are now free to join. However, when savings and credit union activities were extended to Nkandabwe Agricultural Camp, irrigators at Nkandabwe Irrigation scheme objected to belonging in the same union as civil servants. There does not even seem to be any significant cooperative spirit among the irrigators themselves. The GSDP officers attribute this to the technology in use at Nkandabwe, gravity water distribution, and the easy proximity to the main road to the 'line of rail'. The farmers seem to prefer to work individually rather than in a group.

Assessment

In the assessment of the GSDP's experiment with smallholder irrigation we need to identify our frame of reference. As already mentioned in the introduction of this chapter, we are mainly interested in the impact of these schemes only in the Gwembe South area. Our analysis is drawn from the stated objectives of setting up these schemes, in the first place. This is seen from the perspective of the approach taken.

All the project documents studied were explicit on the overall objectives of the schemes. There were primarily to compensate people who were resettled due to the construction of the Kariba Dam. And, in the process, to increase their standards of living. However, it was seen that the type of intervention envisaged had no precedence in the area, so it was proposed to start from a pilot phase so as to generate enough experience (Pyle, 1980) and expertise among the people involved, and also to ascertain the cropping pattern to be adopted on an expanded basis (Banda, 1984). Our purpose is to see whether these objectives were achieved, and, if so, how they came to be ploughed back in the operational phase.

Within the Schemes

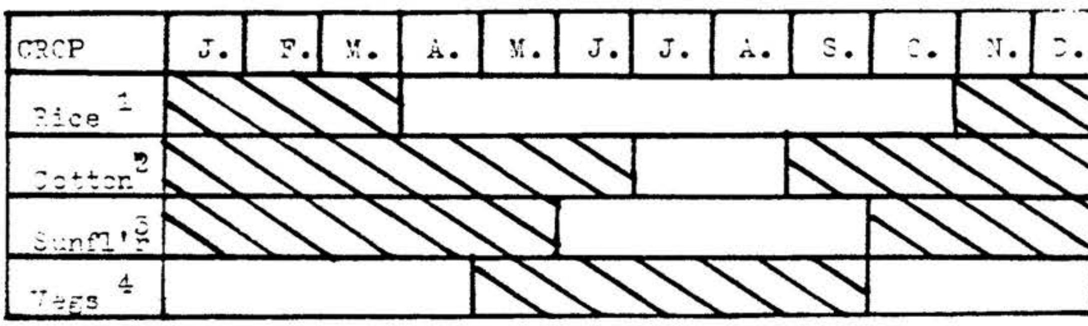
The picture presented clearly shows the influence of institutions involved in the pilot phase. At Buleya Malima we have seen that within a decade the scheme has been passed on from one organisation to another. Although the institutions involved have all been in one ministry, initially the Ministry of Rural Development, later changed to Ministry of Agriculture and Water Development (MAWD), they have all had their own operational criteria. Thus, they all tended to expect different responses which could, in certain instances, conflict (Sandford, 1973). The scheme was initiated by the Projects Division, which was created solely to manage the Ministry's commercially oriented enterprises (UN/ECA/FAO, 1964; Dixon, 1977). The Projects Division was disbanded when the Rural Development Corporation, a parastatal body, was formed to handle its activities.

It seems to have been a contradiction to expect the Projects Division to run a scheme which was initiated, not for commercial gain, but on humanitarian grounds. Thus, within a few years, the scheme was transferred to the Department of Agriculture.

The Department of Agriculture provides agricultural advice on various kinds of activities. Its advice is usually general.

Fig. 5: 2 Cropping Pattern Adopted in Smallholder

Irrigation Schemes in Gwembe South Region



Notes: 1. Grown only at Siatwiinda and Nkandabwe Schemes
2. Grown mainly at Buleya Malima and in upland areas
3. As for 2
4. Grown in all three schemes.

However, at Buleya Malima the main crop, cotton, had its own specialised extension officers. Thus, the work of the Department of Agriculture was mostly in maintaining the government orchard plot and also in providing extension advice to farmers during the dry season, when vegetables are grown. With the coming in of the GSDP, ways are being explored to change the scheme's emphasis from cotton to rice production. This is based upon the GSDP experiment at Siatwiinda, where rice had proved to be the most feasible crop to be grown under irrigation. From the community development component viewpoint, rice serves a double function of being a cash crop as well as a food crop. This is seen as the most important reason because most of the upland areas are all coming under cotton cultivation.

The cropping pattern adopted in the schemes (Figure 5:2) and the nature of marketing services available seem to have undermined the optimum utilisation of the facilities offered in the irrigation schemes. We have seen that cotton production, as exemplified by the whole Buleya Malima Agriculture Camp, is the main thrust, under rainfed cultivation. The cultivation of rice, as adopted at Siatwiinda and Nkandabwe schemes, seems to be the most feasible crop under irrigation, in the Gwembe Valley. However, its production only in the rainy season means that it needs only supplementary irrigation; and the dearth of a definite vegetable outlet should have led, in the short-term, to a change of cultivation pattern to one which allows double rice cultivation in each season; and, in the long term, ways would have to be sought to find means of disposing of vegetables.

Wider Implications (immediate locale)

Since the Gwembe people had the tradition of cultivating the floodplain areas, as we saw in Chapter 3, and the feasibility studies consulted did, indeed, propose that prospects of cultivating the lake recession areas were to be studied during the experimental phases of the schemes to be initiated, we need to look at the results as well, if any.

The experience of the institutions involved in irrigation development in the Gwembe Valley does not show any significant attempt to study the viability of cropping the lake recession areas. It was only in 1982 that the Zambian government, under the Food and Agriculture Organisation (FAO) technical assistance programme, established an experimental irrigation research station at Chiabi (Figure 5:1). They are experimenting with the use of small engine units, of low cost, in the drawing of water from Lake Kariba (Siakautu and Qasem, 1984; FAO-UNDP, 1984). It was just in 1983 that the GSDP, also, started a small experiment on the floodplains of the Lake Kariba tributaries and on the lake's recession areas. However, this experiment has been constrained by the drought (1981-84) which resulted in the drying-up of most tributary rivers, and, also, the fast rate of lake recession. This was compounded by the departure in February 1984 of the GSDP Agricultural Advisor who had worked closely with the seven farmers.

However, the experiences of the irrigation schemes are now compromising off-scheme interests. Because of the lessons learned in the pilot phase and plot, the GSDP is now extending the Siatwiinda Scheme. As we have already seen, the design of the scheme lay-out had a provision of scheme expansion of 80 - 100 more hectares. In 1980, the first phase of extension, to reclaim 10 hectares which were subjected to annual inundation by the lake, was begun with the construction of a dyke. In the 1981/82 financial year, the second phase to extend the scheme by 30 hectares was budgeted for and funds were allocated (Banda, 1984). A third phase, of a further 40 hectares extension, was expected to be budgeted for in the 1984/85 financial year.

The perceived need for the extension of the Siatwiinda Scheme followed from the belief that the crop to be grown under irrigation had been found. The growing number of people on the waiting list for plots on the scheme was also seen, by GSDP promoters, as more justification for the acceptance of irrigation-supported agriculture.

But off-scheme farmers and cattle herders alike see the extension of the scheme as an encroachment upon their land. The areas of extension, towards the lake (reclamation) and along the lake shoreline, seem to be accorded the same value as the river floodplains before damming. Scudder (1969, 1973, 1980) has repeatedly emphasised the potential that this area has both for crop production and for livestock grazing. In fact, most livestock herders on the upland periodically bring their animals to the lakeshoreline for grazing, during the dry season (Scudder, 1980). Thus, the extension of the scheme, mainly for crop production, since, as we have already seen, livestock interests are not considered in the irrigation schemes, tends to extend the conflict in land use between these two agricultural activities (Roder, 1965; Millikan and Hopgood, 1967; Lees, 1974; Sorbo, 1977; Kjaerby, 1983).

To the Gwembe people, it was already expected that once the lake stabilised they would go back to the flood shores to grow crops as they used to on the Zambezi river and its tributaries (Colson, 1971). When the Zambian government came to study irrigation prospects at Buleya Malima it was noticed that people had already started cultivating the lake recession areas (Zambia, 1969). Indeed, during the present drought situation (1981-84) the Times of Zambia, of 1st December 1984, reported that about 18,000 people in Siamponda, Degangeza and Siameja, all in Gwembe South region, had moved with their animals to the shores of Lake Kariba, in search of water and grazing fields.

During the fieldwork of this study (March to September in 1983, and June to September in 1984) it was observed that some irrigators, and those who are not but are staying near Buleya Malima and Siatwiinda schemes, were, for the most part, busy cultivating the areas beyond the schemes, following the lake recession. When water pumping into the schemes ceased from 1983 onwards, only government officers and GSDP advisors could be seen within the schemes.

At Buleya Malima most of the workers were merely maintaining the government orchard. At Siatwiinda ways were being explored to keep the scheme in operation. Through the Gossner Mission intervention, an EEC grant was obtained for the digging of a trench towards the receding lake levels in order to bring water to the pumping units. Although some farmers took part in the digging, it was mainly for the wage employment that it offered.

Summary and Conclusion

In this chapter, an attempt has been made to show the development of irrigation-supported agriculture in Gwembe South region in a historical context. It has been shown that irrigation prospects in the Gwembe Valley had attracted investment interests before hydroelectric prospects were considered. When they came to be considered, it was already seen that irrigation agriculture on the lake shoreline could be practised.

Indeed, even though the design of the Kariba Dam Project ignored irrigation interests, the feasibility studies commissioned by the then Northern Rhodesian and the new Zambian governments confirmed the existence of irrigation prospects in the area.

However, during the pilot phases of the schemes initiated, the institutions involved have tended to concentrate their efforts mainly within the bounds of the schemes concerned. Off-scheme interests, especially in the immediate locale, have only been considered in terms of extending the existing schemes rather than on incorporating the activities pursued there. It has been shown that, consequently, the conflict in land use between crop production and livestock rearing has remained and intensified.

Even though the nature of the status of the schemes reviewed as 'pilot schemes' does not allow us to make judgements on whether they are a success or not, we could still note the innovativeness of the farmers involved and the inflexibility of supporting institutions to absorb the responses. Whereas the farmers involved in the schemes have maintained both the practice of upland cultivation and the lake recession areas, the scheme promoters have remained static at the schemes, even at times when conditions do not allow further use of the schemes (Barnett, 1969). Table 5:9 shows the effect on yield of the phenomenon of continuous cultivation. The GSDP officers attribute the decrease of yield to poor drainage of the plots, which has enabled the sal[illegible] of the soils due to the agricultural chemicals used. This could be the fault of the scheme design (Palmer-Jones, 1974). However, they do not seem to have devised any method of avoiding this problem. The farmers know too well, from experience, that areas which are subjected to seasonal inundation can be cultivated

Table 5:9 Average yield per hectare, of Rice at Siatwiinda and Cotton at Buleya Malima Irrigation Schemes, agricultural seasons 1976/77 - 1982/83 (metric tonnes)

Season	Buleya Malima Cotton[i]	Siatwiinda Rice[ii]
1976-77	1.30	3.84
1977-78	0.67	3.20
1978-79	1.75	4.73
1979-80	1.64	3.77
1980-81	1.24	3.33
1981-82		1.60
1982-83		0.86

Sources: i. Statistical data extracted from the Scheme's and L.E.N.T.C.O. Monthly and Annual Reports, 1976-1981.

ii. Statistical data extracted from the Scheme's Monthly and Annual Reports, 1976-1983.

for ages without ever noticing any remarkable decrease in yield due to over-use. In fact, the fields tend to be replenished in every hydrological cycle.

The lack of any institutional support to lake recesional cultivation can be attributed to a dearth of a formal research-designed support system (Barnett, 1979; Howe and Chambers, 1980; Chambers, 1983). As we have seen, the small experiment supported by GSDP was partly constrained by the high rate of lake recession which affected the soil's moisture content. However, this is mainly a problem of lack of information on the rate of the lake recession. This is also experienced in West African lake areas, where crops tend to be flooded if they are not harvested early or if there is an early and unexpected flood (Harlan and Pasquereau, 1969). In the next chapter, an attempt if made to construct a model which limits these risks based on the experiences of the Lake Kariba fluctuations and the use of the flood warning control system in this area and beyond.

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CHAPTER SIX

Integration of Agriculture to the Fluctuations of Lake Kariba

Experiences and a Hypothetical Case

The most popular criticism of most Tropical African large-scale water harnessing projects, apart from the Aswan Dam, is that they have been planned, and thus operate, with very little regard to the nature of utilisation of the new and emerging resources by the immediate communities. This is mostly the case with hydro-electric generation schemes (H.E.). The developments in long transmission lines have largely thwarted the pull of industry to the areas where the electricity is actually being generated (Dickinson, 1982), and the hoped for benefits from the resettlement programmes have, in most cases, not been realised. Consequently, outright failure and collapse of most of the initiated projects have not been uncommon (Chambers, 1969). Incidentally, behind the gaze of 'official scheme' monitors, the resettled people have been developing their own coping mechanisms to the new environments, devolving from their own appreciation of the new situations. Thus, the post-damming planner is confronted with a situation which was not envisaged when the whole scheme was being planned. To devise a well intentioned intervention programme calls for an in-depth understanding of the new environment.

In the present chapter, an attempt is made to accommodate agricultural interests in the operations of the Lake Kariba Dam. The core of the discussion is based on the design and the actual fluctuations of the Lake Kariba. Drawing from experiences in Gwembe Valley itself and some of the West African and monsoon climate floating rice cultivation areas, a hypothetical model which integrates H.E. generation and agricultural production is presented.

Lake Kariba Water Level Fluctuations, Design and Actual Operations

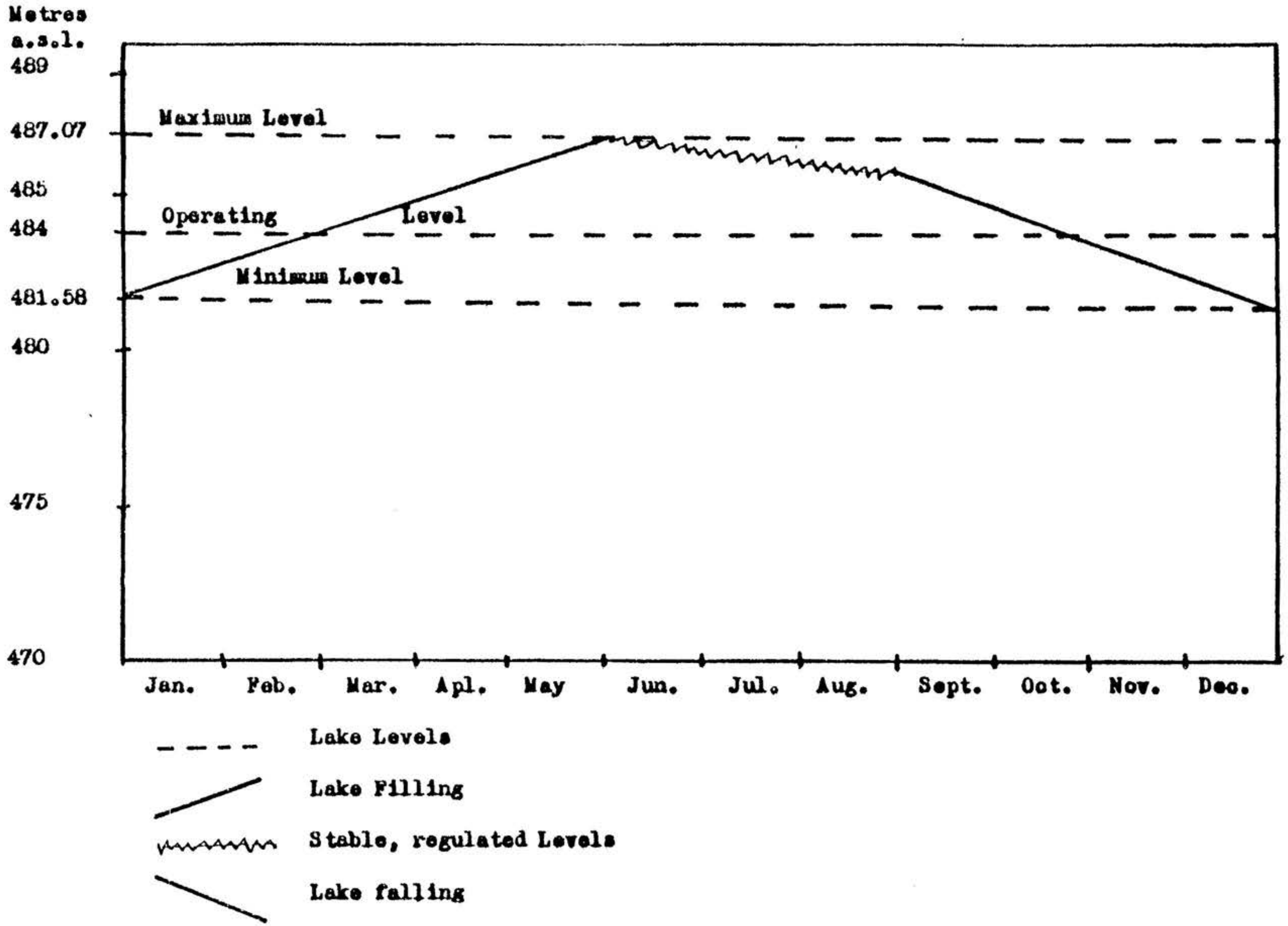
The gates of the Kariba Dam were closed on 2nd December 1958. This resulted in the formation of the Lake Kariba, reputed at the time [illegible] the largest man-made lake in Africa (Brown, et al, 1964; Fels and Keller, 1973). The lake is 320 kilometres long and 20 kilometres at its widest breadth. It has a mean depth of 29.5 metres and a maximum of 120 metres. It covers 5,250 square kilometres and it has a capacity of storing 155 square kilometres of water (Balek, 1977).

According to Allison (1965), the design of the lake allows its level to rise, between the months of January and May, from 481.58 to 487.07 metres above sea level (A.S.L.). During this period, spilling is not to be done. After May, the level can be lowered gradually so as to reach its minimum operating level of 481.58 metres A.S.L. by December. However, in actual operation, the annual draw-down is not to exceed 3.04 metres (Harding, 1965).

In periods of higher than normal inflows, spilling is allowed between January and May. In these circumstances, the lake level is to be held to the maximum level of about 486.15 to 487.07 metres A.S.L. Conversely, with a lower than normal inflow, maximum lake levels are to be kept between 484.63 and 486.15 metres A.S.L. In these circumstances, spilling after May is to be reduced accordingly.

Apart from these natural variations on the Zambezi River hydrology

Fig. 6: 1 Design Spefications of the Levels of the Lake Kariba in a Calendar Year



Adapted from Gibb, (1958), Allison (1965); Reeve and Edmond (1966).

which [illegible] the operations of the lake, [illegible] a definite pattern, there are also operational requirements of hydro electricity generation itself. From June to August, power demands on the Lake Kariba Dam are at their maximum (Allison, 1965; Hickling, 1975). To cope with the demand, spilling through the flood gate is restricted during this period. Thereafter, up to December, the design allows for a more rapid rate of spilling, and thus lake level lowering (Figure 6:1).

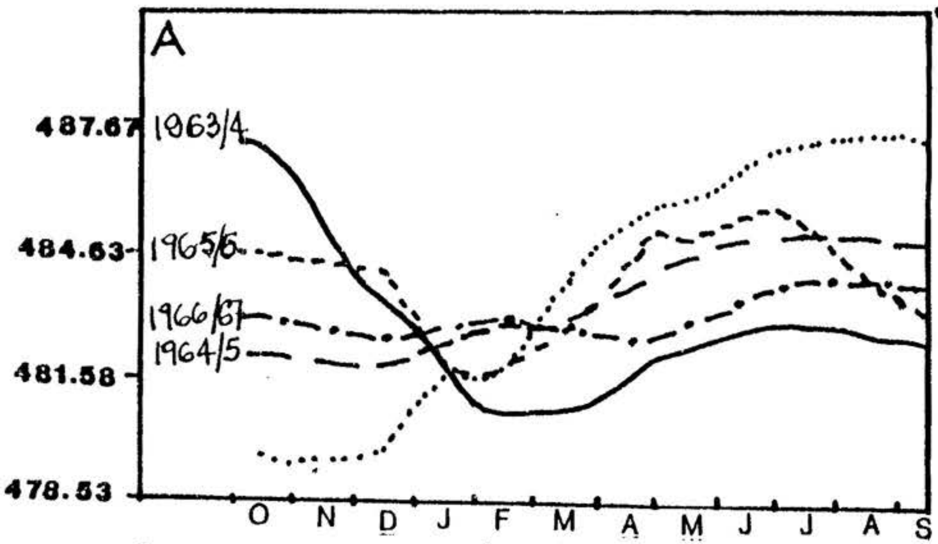
These lake level fluctuations, between the maximum and minimum levels, affect a tract of land which we defined in chapter two as the drawdown areas. At its optimum maximum level, the lake covers an area of 55.3×10^2 km^2, and at its lowest operating level it extends over an area of 43.8×10^2 km^2. The area of fluctuation (or rather the normal operating drawdown area of the lake) is thus 11.5×10^2 km (1,150 km^2 or 115,000 hectares)[1], but its extent at any position depends on the gradient of the shoreline and the level of the lake in each hydrological cycle.

The actual operations of the Lake Kariba, since it was opened, show some variations from the design specifications of lake fluctuations (Figure 6:2). When the gate was closed in 1958, the lake level kept rising to reach a level of 484.8 metres A.S.L. in 1963/64 hydrological year. Then, the level dropped rather rapidly by as much as 6 metres before it began to rise in March of 1964 (Scudder, 1969). This drop went below the expected minimal level of 481.58 metres A.S.L. and the drawdown itself exceeded the specified range of 3.04 metres between the highest and lowest levels of each hydrological year. This situation was allowed in order to allow CAPCO engineers to excavate

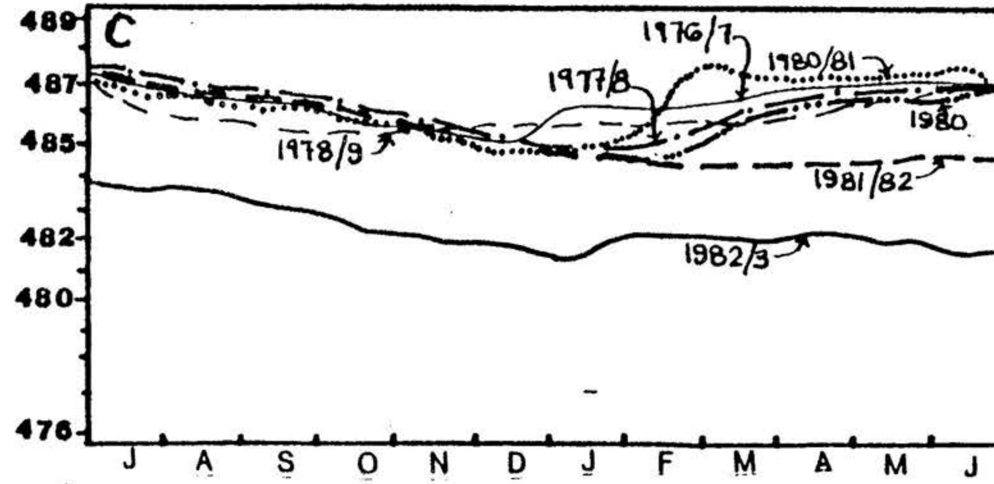
Footnote

1. Statistical data provided by Dr. Peter Bolton of Hydraulics Research, U.K.

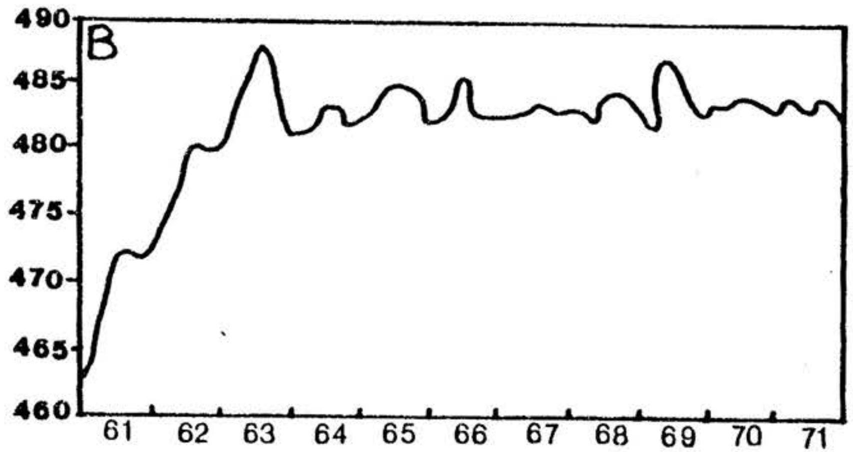
Fig. 6: 2 Fluctuations of Lake Kariba Water Levels, 1961 - 1983



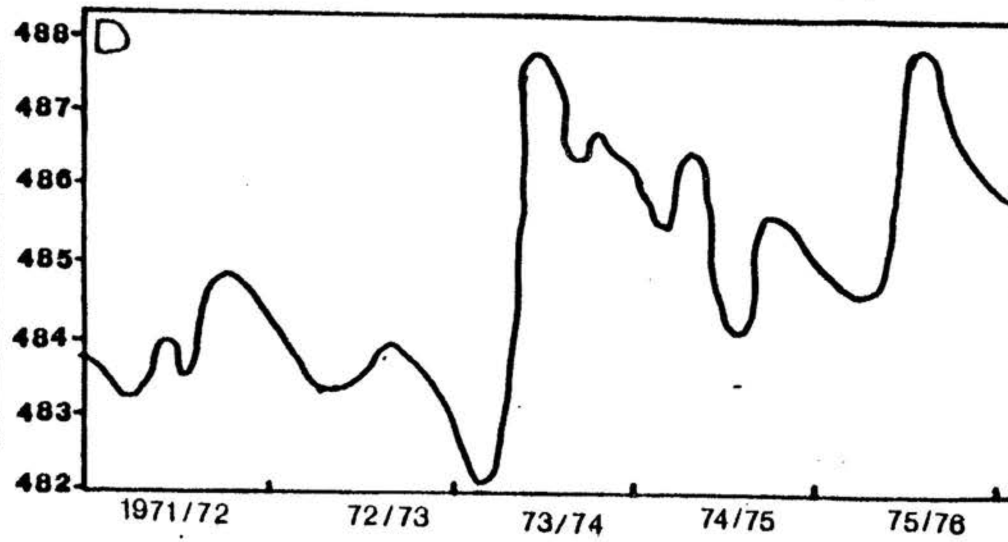
Source: Scudder, T. (1979), p. 225



Source: CAPCO Annual Reports 1976/7 - 1982/3



Source: Begg, G.W. (1973), p. 422



Source: Personal Correspondence with Dr. Peter Bolton; Data collected through work on the Zambezi River, 1978, 1983, 1984.

the spilling pool below the dam wall (Begg, 1973).

From 1964/5 to 1967/8 hydrological years, the level was mostly between 485 and 481 metres A.S.L. In 1968/9, the level reached a maximum level of 488 metres A.S.L., and it was dropped to 482.5 metres A.S.L. towards the end of the year. From 1969/70 to 1972/3, the level was mostly between 484 and 483 metres A.S.L., with very slight variations. In 1973/4, it came down to almost 482 metres A.S.L. and rose rather sharply to almost 488 metres A.S.L. Thereafter, it started falling rather gently without significant rises until it reached a level of almost 484 metres A.S.L. in 1974/5. In 1975/6, it again rose sharply to almost 487 metres A.S.L. Between 1976/7 and 1980/1, the level has mostly been between 487 and 485 metres A.S.L. From 1981/2 to 1982/3, it has been lowering. It came to reach almost 482 metres A.S.L. in 1982/3. The level kept on falling and on:

> "20 January 1985, the level of Lake Kariba was 476.54 m, which is the lowest recorded since the dam was filled". (Personal letter from C.A.P.C.O., dated 30/04/85)

In as far as the extent of drawdown area is concerned, it was in 1968/69 hydrological year that the maximum area was exposed. The lake level dropped from 488 to 482.5 metres A.S.L. This corresponded with a change in the surface area of the lake from 54.2×10^2 km^2 (5,420 km^2) to 50.6×10^2 km^2 (5,060 km^2) and hence a drawdown area of 3.6×10^2 km^2 (360 km^2 or 36,000 hectares (ha.)); and the minimum drawdown area of only about 40 km^2 (40,000 ha.) occurred in 1969/70 hydrological year, when the lake only dropped slightly before it started rising again. Thus, in the period under review, the optimum drawdown extent of 115,000 ha. did not occur, as the lake level, itself, did not fluctuate between its extreme high and low levels in any one hydrological cycle.

Despite these variations in the lake fluctuations, and hence in the extent of the drawdown areas, the Central African Power Corporation (C.A.P.C.O.) has the technological capacity of predicting the likely trend of flooding by the major head water from the Upper Zambezi Basin, 30 days in advance (Allison, 1970). This is enabled through the use of the Flood Warning Control System. The regulation of the Lake Kariba is then done according to the operational requirements.

Implications of Lake Fluctuations on Agricultural Activities based on the Lake Kariba Shoreline

Although the design and thus operation of the Kariba Dam have had no agricultural consideration, the fluctuations of the levels of the Lake Kariba have had a tremendous effect on the agricultural activities that have developed on its shoreline. This has affected both the irrigation pilot schemes and the local people's spontaneous cultivation of the drawdown areas.

Smallholder Pilot Irrigation Schemes

As we saw in our last chapter, two of the irrigation schemes considered, that is Buleya Malima and Siatwiinda, are based on the lake shoreline (Figure 5:1 in chapter five). These sites allow drawing of water from the lake. However, they all experience periods of water shortage whenever the lake level goes below their water pumping design level specifications.

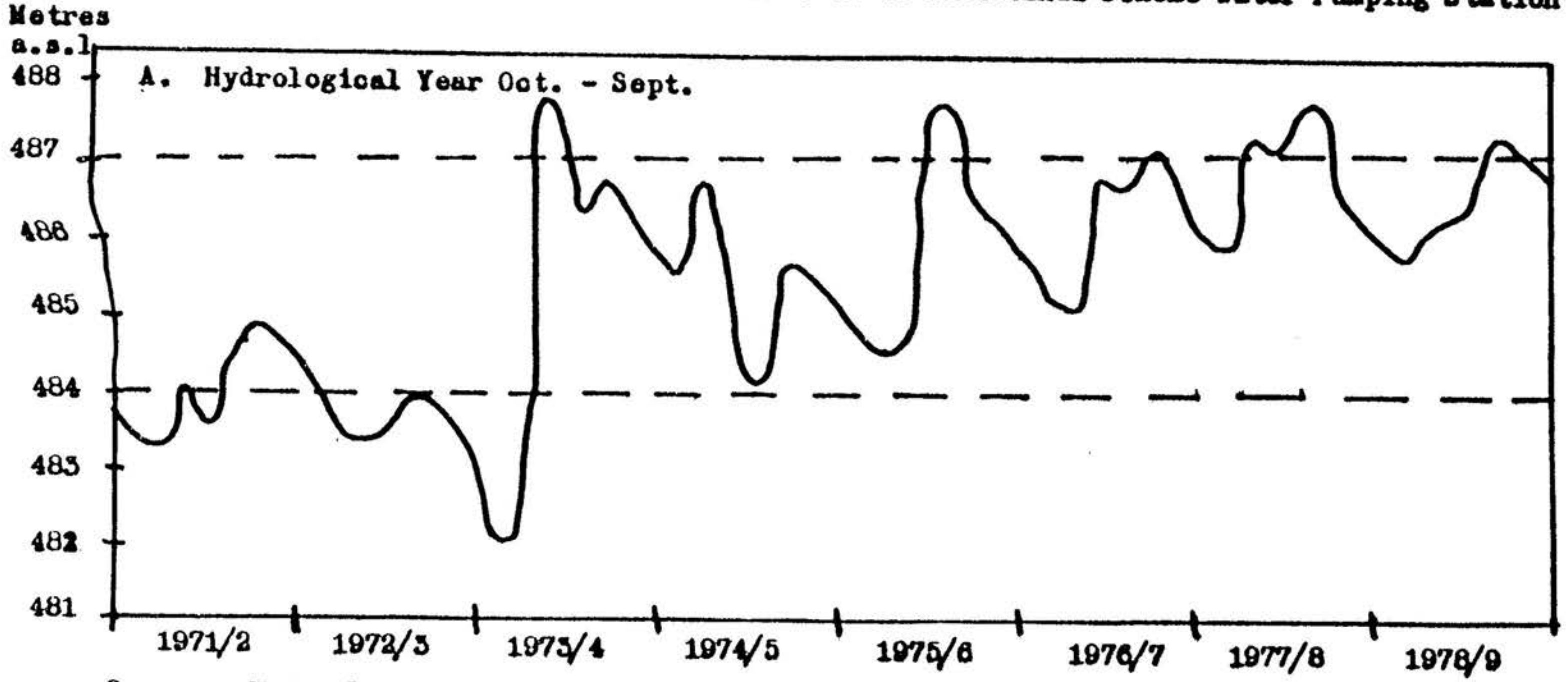
When we discussed the Buleya Malima design, we saw that its lowest lake pumping level was set at 477.01 metres A.S.L., although the consulting engineers also noted that, in extreme conditions, the lake level could even go beyond that, to reach the 475.48 metres A.S.L. mark. In the first twelve years of operation of the Buleya Malima irrigation scheme, the water levels of Lake Kariba never reached these low levels (Figure 6:2). However, in June 1983, the lake level lowered to 481.79 metres A.S.L., and if we have to take into account the normal spillage after August, the lake level dropped further. Thus, from September 1983, water pumping at Buleya Malima ceased and the farmers abandoned the scheme altogether, except for the government workers who remained, maintaining the government orchard plot.

With no appreciable increase in rainfall in the 1983/4 season, the lake level continued lowering. As we have already seen, in January 1985, the lowest level since the lake was created was reached. Consequently, from September 1983, the Buleya Malima irrigation has not been in operation.

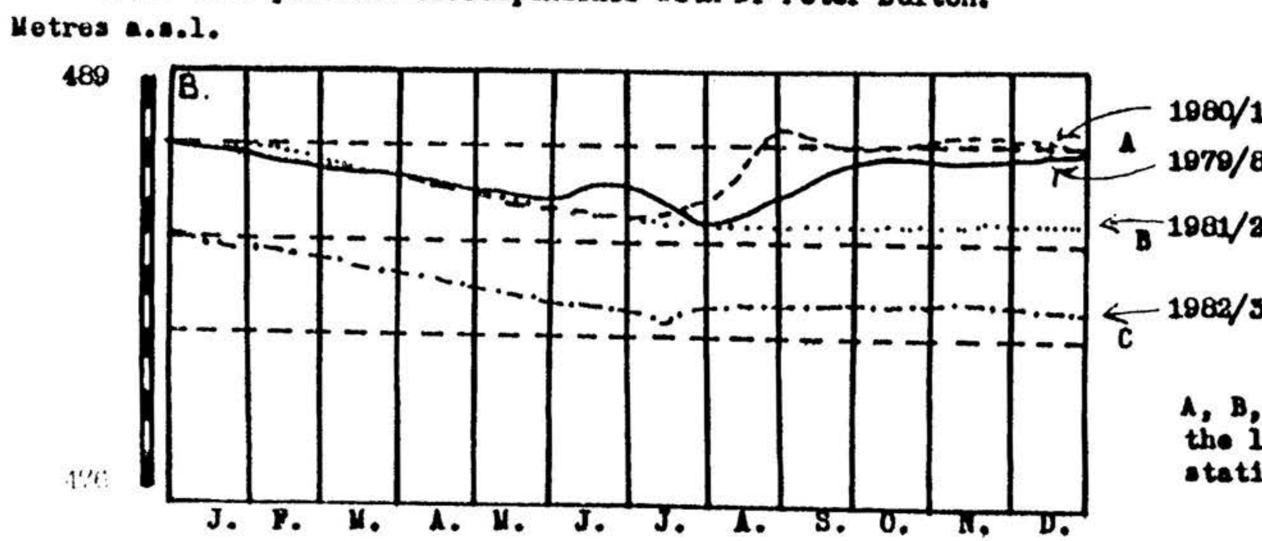
At Siatwiinda, there are three pumping stations. The maximum water level for efficient water pumping was set at 487 metres A.S.L.; the normal operational level, which also corresponds with the normal operational level of Kariba Dam is 484 metres A.S.L., and the minimum water level pumping station is located along the 481 metres A.S.L. (Figure 6:3).

In the period of operation, since 1972, whenever the lake level came below the 487 metres A.S.L., water pumping units had to be shifted to the water station on the 484 metres A.S.L. This occurred throughout the period under review. However, in 1982/3 hydrological cycle, water pumping units had to be shifted to the 481 metres A.S.L. station. This could have happened in 1972/3 hydrological season as well, when the water level came under 485 metres A.S.L. Indeed, in

Fig. 6: 3 Lake Kariba Water Levels in Relation to Siatwiinda Scheme Water Pumping Station 1971 - 1979



Source: Water levels from personal correspondence with Dr Peter Bolton.



A, B, and C are lake levels at the locations of water pumping stations

Source: Water Levels, CAPCO Annual Reports, 1979 - 1983; location of pumping stations GSDP, Memo, 1984

1983/4 hydrological year, pumping had to cease altogether, as the water level went below the pumping capacity of the minimum lake level pumping station.

Thus, the design of the water pumping levels of these two schemes allows them to pump water in any normal operational fluctuations of the Lake Kariba. However, in periods of very low water levels, the Siatwiinda scheme ceases to pump water whenever the water level goes below 481 metres A.S.L.; and even though the Buleya Malima design allows it to be in operation even in severe low water levels, from 1983/4 hydrological cycle it could not function as the water level, and hence recess, went below and further away from the water pumping stations.

Paradoxically, the experience with the pilot irrigation schemes in Gwembe Valley reveals that these types of scheme, which rely on drawing of water from the lake shoreline which fluctuates with no agricultural consideration, inhibits them to be used in times of acute need which, according to the consulting engineers of Buleya Malima, should happen every 16 years (Robert, et al, 1961). The present scarcity of food in Gwembe Valley, due to the drought (1981-4) that has plagued most of the Southern African countries, has forced the Gwembe South Development Project to explore ways of making the Siatwiinda scheme operational, even in these severe situations. However, the intervention devised of digging a canal towards the lake, without any knowledge of how far the lake would recede, is not producing the desired results, as the lake continues to recede as they dig towards it.

Spontaneous Cultivation of the Drawdown Areas

As we saw in chapter three, before the relocation associated with the Kariba Dam construction, the Gwembe Tonga used to cultivate the flood plain of the Zambezi River and its tributaries. With the lake formation, these areas of flood plain cultivation were inundated. However, the annual fluctuations of the lake have created new areas which are also subjected to annual flooding and then exposed, like the former riverine flood plains. These new areas have been seen and defined as:

> "those areas bordering the lake which once every year are alternatively flooded and then exposed as a result of the seasonal fluctuations in the lake levels (Amatekpor, 1976, p 1).

In our discussion of the Gwembe Valley traditional land use system, we saw that the flood plain cultivation system was based on soils which are of exceptional agronomic potential because they were seasonally replenished by the alluvium deposits of the rivers; and in our discussion of the geographical features (chapter two) we saw that a recent soil survey on the drawdown areas of the Lake Kariba has come to reveal that these areas also tend to have similar soil properties as those found on the former riverine flood plains (Magai, 1983). Similar findings have been noted in Ghana along the shores of the Volta Lake. After five years of lake formation, Amatekpor (1976) noticed that the lake fluctuations had:

> "caused changes in the relative rates of the pedogenic processes resulting in significant changes in the properties of the soils morphologically, chemically and

mineralogically" (_ibid_, p ii)

Indeed, Amatekpor came to the conclusion that the process was creating an area which is of considerable potential for agriculture, especially dry season farming.

As we can see, these findings were made long after the lakes had stabilised themselves. The Lake Kariba survey was conducted twenty-three years after the dam construction. It seems this was unexpected. In the period just before and after lake formation, it was generally believed, in both cases, that the resettlement entailed was going to disrupt the traditional way of life and that the livelihood of the people was going to be severely compromised (Colson, 1960; Chambers, 1970). However, in the first fluctuation cycle of the Lake Kariba, from 1963/4 to 1964/5 hydrological year (Figure 6:2A), the Gwembe Tonga already started cultivating the drawdown areas, as they used to on the riverine flood plains (Scudder, 1969; Scudder and Colson, 1979). Even at this early stage, the crops harvested were noted to be the best in Gwembe Valley conditions (Scudder, 1969). The Zambian government report which considered the feasibility of smallholder irrigation at Buleya Malima also acknowledged this spontaneous cultivation of the drawdown areas (Zambia, 1969). However, it did not suggest any measures of intervention in order to improve it. Nevertheless, the Gwembe Tonga have, on their own, continued to cultivate the drawdown areas, whenever chance has permitted; but before we present our drawdown cultivation hypothetical model, which tries to correspond with the Kariba Dam operations, we shall need, initially, to identify some of the virtues and weaknesses that the present spontaneous drawdown cultivation possesses, encounters and poses on the existing Gwembe Valley land use system. This will be done from a firm belief that whatever is suggested in the smallholder section should be based on the farmer's own existing production level.

As far as the ecological significance is concerned, we have already shown in a number of places that the drawdown areas have potential for agriculture development (Amatekpor, 1976; Magai, 1983). Thus, we will not discuss the pedological issues here. We shall mainly concern ourselves with the effects of the lake fluctuations on the cultivation pattern that has been developed. The interaction of drawdown cultivation and the upland agricultural activities, that is dryland cultivation and livestock rearing, will also be explored.

Effects of Lake Kariba Water Fluctuations on the Drawdown Cultivation Pattern

If we have to infer from the design of the Lake Kariba fluctuations (Figure 6:1) we see that it is only after August that the area for cultivation will be exposed by the receding water. This means that it is only when the lake is receding that crop cultivation can be practised. Since the rate of recession is also rapid during this time, it means that much land would be exposed in a relatively short time; and if the local maize variety Kaile is grown, which happens to mature in 90 days, by the end of December and early January, the crop could be harvested. This tends to fit nicely with the design of the Lake Kariba fluctuations and, as far as food availability is concerned, it enables the provision of food at times in which it is normally scarce, the late dry and early wet season (Scudder, 1971; Brooke, 1972; Chambers, 1983).

In actual practice, the lake fluctuations and thus the drawdown cultivation have not taken a definite pattern. There has been variation, both in the recession and flooding of the lake (Figure6:2). Although the lake design specifies that the lake level would be kept fairly static from July to September, Figure 6:2C shows that, in the hydrological years between 1976/7 and 1982/3, the lake level tends to decrease rather gradually from July on and, in 1976/7 hydrological year, the lake level dropped by almost a metre in July alone; and the rise of the lake level has, at times, been too instant. For example, in 1977/8 hydrological year, the level of the lake rose by almost 2 metres between December and January due to the heavy inflow from the lower catchment (Capco, 1979).

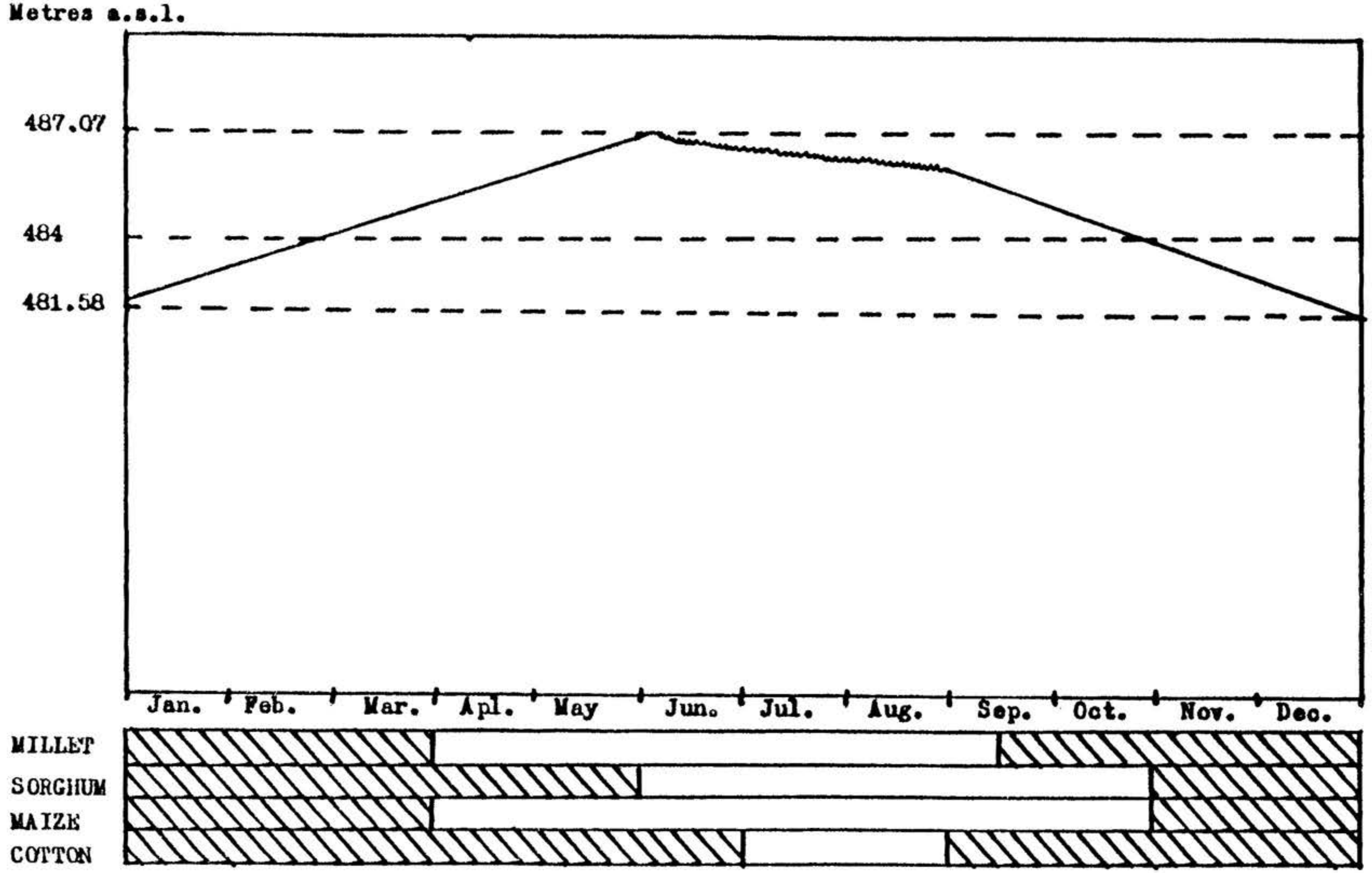
These limitations and uncertainties that the lake fluctuations pose on the agricultural activities based on the Lake Kariba shoreline are largely due to the cultivators' lack of knowledge on the lake's behaviour (fluctuations). Paradoxically, the use of the flood warning control system has enabled C.A.P.C.O. to develop the capacity of monitoring the nature of the hydrology of the Upper Zambezi Basin, and thus they have the knowledge of the likely flooding extent of the Lake Kariba far in advance.

Drawdown Cultivation and Upland Cultivation: Conflict or Complementality

In our discussion of the pre-damming land use system, we demonstrated how the upland cultivation system came to be a reaction to the shortage, and thus fragmentation, of land in the flood plain areas. The continuous cultivation of the upland came, consequently, to require periodic fallowing of cropping land so as to enable it to replenish its fertility. In the resettlement areas, however, the scarcity of good agricultural land and the concentration of populations in those little pockets of good agricultural land, the practice of periodic fallowing of cropping land has been inhibited. Incidentally, the annual flooding and recession of the lake levels has diffused, to some extent, the land hunger and, as we have seen, people have responded to the cultivation of these areas. Although this has been seen as an adoption of their long-evolved technology on the new environment, we have to see whether it fulfils the functions that we saw as virtues in the old system. There we saw that, although the upland cultivation was a new phenomenon, it complemented the flood plain cultivation, in that it enabled the distribution of agricultural activities, and most importantly food availability, throughout the year; and we need to see whether the requirements of the drawdown cultivation system exhibit some conflicts with those of the upland activities. Here, again, we shall need to see how the design and the actual operations of the Lake Kariba fluctuations relate to the upland agronomic activities.

If we integrate the lake fluctuations specifications (Figure 6:1) and the existing dryland cultivation pattern (Table 4:1 in chapter four), we end up with a situation depicted on Figure 6:4. This figure clearly demonstrates that drawdown cultivation and upland cultivation cannot adequately be integrated. The period June/July to August/September, which can be termed as a slack period for the upland activities, happens, also, to be the time that the design of the lake levels requires it to be kept at a relatively static position. Thereafter, when the lake level is lowered, potential drawdown cultivation areas are exposed. However, this also happens to be the time that the upland areas have to be cultivated. The risks and uncertainties involved both with drawdown and upland cultivations, early flooding and unreliable rainfall respectively, will tend to persuade the cultivator to distribute his resources between the two areas, so as to ensure a certain amount of harvest.

Fig. 6: 4 Design Specifications of the Water Levels of the Lake Kariba and upland Cultivation Patterns in a Year



Cultivation Period

Adapted from Fig. 6: 1, Banda, 1984.

As far as labour resource is concerned, if it has to be distributed between the two activities, it will have to be done very sparsely. In situations where the cultivator also grows cotton, like evidenced at Buleya Malima camp, in chapter three, it is most likely that the cultivator will opt to cultivate cotton. This is exacerbated by the regulations that cotton cultivation entails. The cotton package ensures that the cultivator follows the cotton agronomic activities to the letter. Thus, the cultivator will have very limited time to attend to the drawdown field, which has its own demands if crops have to be harvested before the annual flood which could inundate the crops standing in the field.

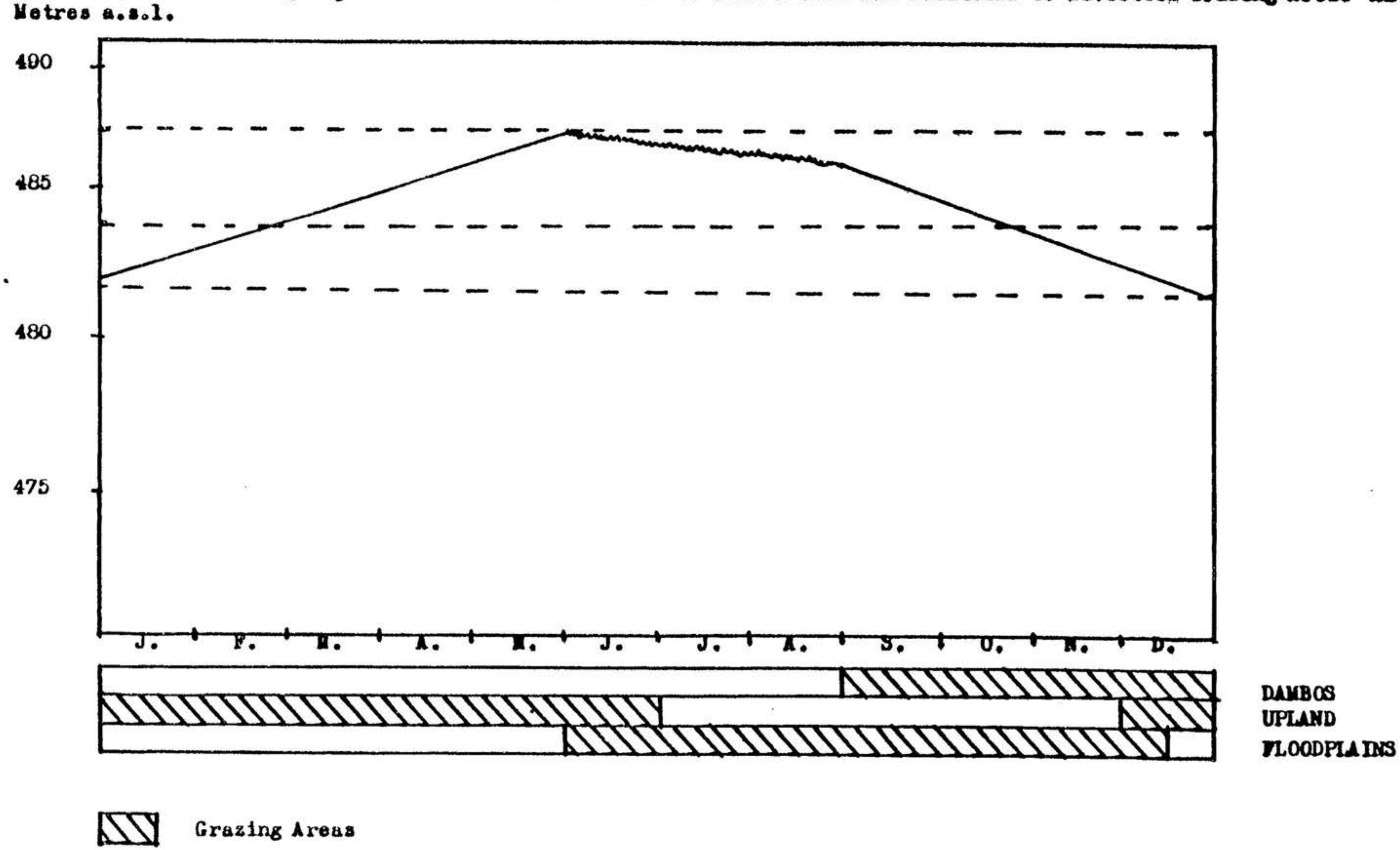
Despite these drawbacks, we have seen that some farmers have reduced the risks involved by growing fast maturing local maize variety Kaile on the drawdown areas, and also participated in the cultivation of cotton and sorghum on the upland. The concentration of agronomic activities for both areas cannot be without constraints. Indeed, it was noticed in 1983 at Buleya Malima Agricultural Camp that the low yield of cotton could partly be attributed to the use of some of the cotton chemicals on other crops grown on the irrigation scheme (Banda, 1984). An almost similar case has been reported on the Gezira Scheme, in Sudan, where it was noticed that the farmers had devised their own ways of water distribution in their own plots. To maximise output in their food crop plots, they watered it before the cotton field. Incidentally, although this was against the Gezira Scheme Board Regulation, it had some beneficial impacts in that the cotton production was not affected and food was grown (Burnett, 1979). Thus, it can be seen that where possible the cultivator, of both fields, might at times distribute his resources. This could bring unforeseen effects.

Drawdown Areas and Livestock Rearing

In a number of more recent studies, the importance of livestock in some of the traditional land use systems has been highlighted (Johnson, 1969; Sorbo, 1977; Kjarby, 1983; Lako, 1985). Unfortunately, this realisation has not been reflected in water manipulation discussions. The more recent F.A.O. publication on smallholder irrigation does not say much about the place of livestock in irrigation schemes (Underhill, 1984); and most of the deliberations of the recent symposium on smallholder irrigation in Africa only mentioned livestock rearing problems merely as one of the side effects of the crop production promotions (Blackie, 1984). The literature surveyed does not cite a case in which smallholder livestock improvement methods were part of any large-scale water manipulation intervention. Experiences in Gwembe Valley, fortunately, do tend to suggest that smallholder livestock rearing techniques could easily be integrated into the operations of large-scale man-regulated lakes.

In our last discussion, we saw how difficult it was to integrate drawdown and upland cultivation activities. In our discussion of the existing land-use system, we saw that there is an apparent arable land shortage. The traditional livestock system was seen to be extending the conflict. We actually saw the situation as being severe towards the end of the year when the cereal stalks in the fields have been exhausted and when most of the land is being prepared for the next agricultural season. During these times, animals tend to be concentrated in the few dambos which are still having some shrubs; but, on the whole, there tends to be severe scarcity of grazing areas. However, both the design and the actual operations of the lake fluctuations have tended to diffuse this pressure, to some extent.

Fig. 6: 5 Design Specifications of the Waters of Lake Kariba and locations of Livestock Grazing Areas through the Year



Adapted from Fig. 6: 1, Banda (1984).

Figure 6:5 integrates the lake fluctuation design and the spatial location of grazing areas in one calendar year. We see from this figure that there are three principal grazing areas which are periodically utilised. At the beginning of each agricultural season, that is from August to some time in December, animals are normally restricted to the few dambos where some green vegetation can still be found. Once these are exhausted, the animals are brought to the highlands where they tend to be restricted to some hilly areas.

As we have already seen, from this time on, most of arable upland areas are under cultivation. The crops will be in the field until they are harvested some time in May. Thereafter, the animals are let to wonder freely and graze on the cereal stalks.

However, due to the popularity of cotton cultivation, the areas used for cereal cultivation tend to be limited. Thus, the grazing period on the cereal fields will be limited; and the free movement of animals tends also to be restricted because some farmers tend to extend their harvesting period much into the second half of the calendar year. Nevertheless, the usual livestock grazing on the cereal fields is between May and August. From that time on, free roaming of animals is restricted as most land is put on the new agricultural season activities.

The recession of the lake just at the time that land is brought back on crop production offers a new area for livestock grazing.

From the first time that the Gwembe Valley cultivators turned on the cultivation of the drawdown areas, in the recess of 1963/4 hydrological year, they could also have let their animals graze on some of the drawdown area vegetation. As we saw in chapter four, the

Gwembe Valley land use system does not restrict livestock grazing areas. Thus, the free wandering of animals could have easily responded to the utilisation of this resource.

There are a number of factors which support livestock grazing on the drawdown areas. The prime one, as we have already seen, is that it tends to ease the conflict of land use between livestock grazing and crop production, especially towards the end of the calendar year (Figures 6:4; 6:5). Moreover, the contradictions between drawdown cultivation and upland cultivation reduce the chances of extension of this conflict in the drawdown areas; and the traditional rearing methods tend to confer the utilisation of the area which is gradually exposed, as the lake recedes.

Indeed, during the period under review, it has been noticed that the Gwembe Tonga normally let their animals graze on the dambos, as well as the drawdown areas, especially in the last quarter of the calendar year. According to Scudder (1979), the Lake Kariba drawdown area provides a grazing resource of considerable potential; and he speculates that there could be similar properties in some of the West African lakes like Volta, Kainji and Kossou (ibid). Bingham (1978) presents a similar view as regards the Kafue Flats, along the Kafue River; and Fahim (1981) describes a situation around the Aswan Lake where the drawdown area is used in this manner.

At the present utilisation of the drawdown area for livestock grazing, the system encounters the problems of sudden and early flooding. Whenever this occurs, the livestock head is immediately brought to the upland where there is very limited pasture. If the flood comes late and gradual, the animals can also slowly graze on the growing vegetation on the upland.

We can, thus, appreciate the need of integrating agricultural interests in the lake regulation so as to mitigate against the weakness that the lake fluctuations pose on agriculture.

Integration of Agricultural Activities to the Operations of the Lake Kariba

In our last discussion, we saw that the major drawbacks in the agricultural use of the drawdown area were mainly that the existing cropping pattern inhibits the cultivation of two fields concurrently; and also that the risk and uncertainty about the lake behaviour, especially early and rapid flooding, tend to undermine the farmers' confidence even in the drawdown's use as an alternative grazing field in the later part of the year. Of course, this is not surprising, as the dam design precluded any agricultural consideration in its lake level operations. Nevertheless, we have seen that the use of the information provided by the Flood Warning Control System, if supplied to the farmers at the right time, could reduce some of the dangers that the lake fluctuations pose to the agricultural activities on its drawdown areas; and, since the dam is already in operation, much according to its design, we should try to devise an agricultural strategy that adapts to the design, and thus operations, of the lake levels. This is not without precedence.

The Precedence: Hydro-Electric Generation and Other Interests. The Use of the Flood Warning Control System.

Adjustments in the Kariba Dam Hydro-Electric project have been going on since the construction period. During the construction phase, the design of the Kariba Dam had to be changed twice because of the unexpected floods which occurred in 1957 and 1958 (Gibb, 1958; Reeve and Edmonds, 1966). As we have already seen, in the first fluctuation cycle of 1963/4 hydrological year, the water level was lowered much below the expected minimum levels so as to enable the C.A.P.C.O. engineers to excavate the spilling pool below the dam wall (Reeve and Edmonds, 1966; Begg, 1973). The contractors of the Cabora Bassa Dam, downstream in Mozambique, were safeguarded from unexpected flooding by the information that C.A.P.C.O. transmitted to them about the hydrological situations in the Upper Zambezi Basin, which affected the regulation of the Lake Kariba (Middlemas, 1973; Appleton, 1974; Bolton, 1983). The co-ordination between the two schemes is still being seen as of utmost importance in the monitoring and designing of flood mitigating programmes in Mozambique (Wisner, 1979); and, of course, the contractors and operators of the Kariba North Bank, on the Zambian side, are making use of the facilities that C.A.P.C.O. developed.

In as far as wider distribution of the hydrological data is concerned, every fortnight C.A.P.C.O. does send this information to all interested parties. On the Zambian side, this information is sent to the following institutions:

The Ministry of Power and Transport, Lusaka.
The University of Zambia, Lusaka.
The Fisheries Research Station, Chilanga, Lusaka.
The Department of Water Affairs, Lusaka.
The C.A.P.C.O. Regional Office, Lusaka.

During the interview I had in Harare, in September 1984, with the C.A.P.C.O. Hydrologist in charge of the Flood Warning Control System, I was informed that some farmers on the Zimbabwean shoreline were also being supplied with this information. Yet, in Zambia, the Department of Agriculture, which is in charge of the agricultural extension system, is not on the mailing list; and neither are any of the farmers who already use the lake shoreline for their own agricultural activities. In the next chapter, we shall discuss the mechanism that could convey this type of information to the farmers concerned. Here we are mainly interested in the integration of agricultural activities at the production level.

Agricultural Integration

Since the design of the Kariba Dam has no agricultural consideration, the knowledge that C.A.P.C.O. is willing and does provide hydrological information to other interested parties persuades us to design an agricultural paradigm which adapts to the lake operation, but which does not necessarily compromise hydro-electric generation requirements. This model has to be based to the actual design of the lake level, in the first instance.

In as far as crop production is concerned, the experience presented on the Gwembe Valley land use system has shown that two main crops have already shown themselves to be feasible for growing in the draw-down areas. The farmers' cultivation of the local maize variety Kaile, which happens to be of relatively early maturing (90 days) has been shown to be appropriate in cultivating as the lake recedes. However, the uncertainty about the lake behaviour, and more importantly the existing cultivation pattern, on the upland, has been seen to be inhibiting its widespread cultivation during the late dry and early rainy season, on this area. Thus, its cultivation will still face some problems.

The rice agronomic research and the experiences of its cultivation at Siatwiinda Pilot Irrigation Scheme, just on the shores of the Lake Kariba (Figure 5:1 in chapter five) have also offered a crop to be considered. The research component confirmed the adaptability of rice in Gwembe Valley conditions; and according to the Gwembe South Development Project, rice has come to be accepted as one of the local food crops. This experience is quite valuable in our discussion. However, we have to see how its cultivation pattern could adapt to the Lake Kariba fluctuations.

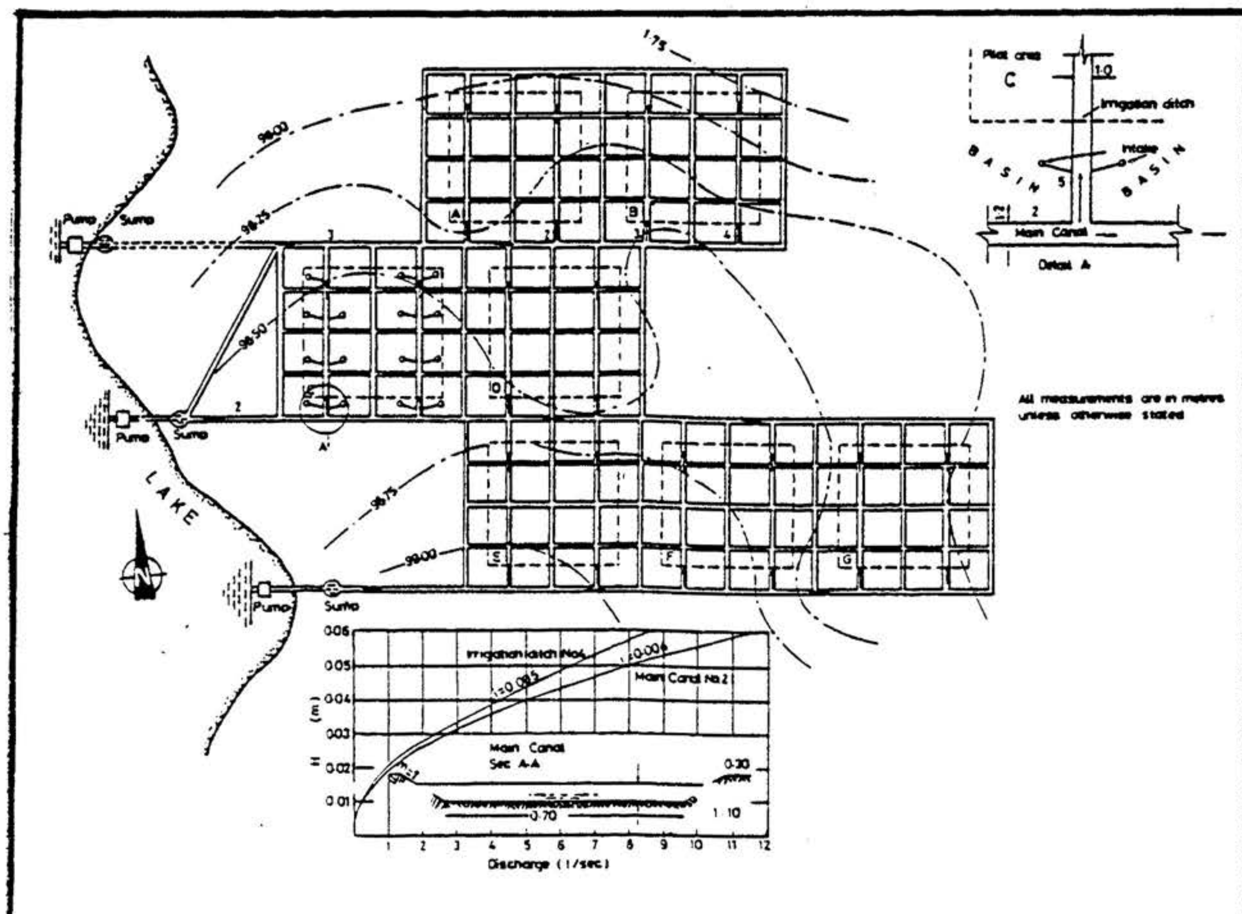
At Siatwiinda irrigation scheme, paddy rice is grown. It is planted in basins which are flooded by rain and supplemented by the water drawn from the lake by an engine pump. Thus, it is not submerged in water for long periods. For this rice variety to grow in the drawdown areas, the fields have to be reclaimed from flood inundation by the construction of a dyke. Indeed, from 1980 to 1984, 40 hectares were reclaimed and added to the scheme. Once this is done, the area is then freed from seasonal flooding, and, as such, it ceases to be a lake drawdown area. It just becomes like any other conventional irrigation plot.

We have already seen that G.S.D.P. also tried a small rice growing drawdown experiment on the lake shoreline, and the flood plains of some of the local rivers. It was discontinued, partly because it became difficult to maintain moisture in the soils without the aid of an engine which could bring the water to the plots. This was made worse by the fact that, when the rice was being planted, the water was receding further and further away from the rice plots.

We have already seen that under a G.R.Z.-F.A.O. collaboration, a small irrigation experiment, using small engine pumps, is being conducted at Chiabi, also on the lake shoreline (Qasem and Siakantu, 1984). This scheme does not necessarily fit our definition of a drawdown subjected area as its water needs are supplied with the aid of engine pumps (Figure 6:6).

Thus, we see that, although these two crops have proved suitable for cultivation in Gwembe Valley drawdown conditions, maize cultivation is being hampered by the existing cultivation pattern, and the rice variety grown requires embankation and reclamation of land from flood subjectivity. It then follows that, if we have to exploit the drawdown resource, we shall need to adjust the existing cultivation pattern and, where possible, select a suitable crop variety. However, if the cropping pattern is adjusted to a situation where maize is not grown during the later part of the year, then it will not certainly be grown during any other time on the drawdown area when it is flooded; and we cannot suggest the upland areas, as these are already under other crop cultivation anyway. Thus, we remain with rice, but the rice variety presently grown at Siatwiinda is a rain-fed variety. It could be grown during other times with the aid of irrigation, in plots where water distribution is carefully controlled. This variety cannot easily be grown on the drawdown areas. Thus, we need to find a suitable variety which could successfully be grown in the drawdown areas of Gwembe Valley. In this regard, <u>floating or deepwater rice</u> emerges as the only alternative. Its cultivation will have to be adapted to the hydrological design of the lake fluctuations. Before we proceed with this discussion, we have to see <u>the experiences that other areas have had with floating rice</u> (Gourou, 1966).

Figure 6:6 Chiyabi Pilot Irrigation Scheme. Layout of Pilot Area



Source: Siakantu, J. B. and Qasem, M. A. (1984) p.239

The practice of floating rice cultivation seems to have a very long history in Africa (Porteres, 1966; Harris, 1976; Carpenter, 1978). Nevertheless, efforts to expand rice production have, rather, focussed on the recently introduced Asian varieties, largely ignoring the improvement of the indigenous rice culture (Buddenhagen, 1978); and, where the generally tropical rice varieties have been improved, the area of concentration has been the reduction of their height (Chandler, Jr., 1973). Thus, at the moment, floating rice tends to be associated mainly with the 'monsoon' climate areas (Ramiah and Ramaswami, 1941; Webster and Wilson, 1966; Grigg, 1974; Greenland, 1984). Yet, it is widely cultivated by the small-scale farmers in some of the West African states (Jordan, 1962; Webster and Wilson, 1966; Carpenter, 1978; Richards, 1983). As far as the agronomic requirements are concerned, floating rice tends to suit the Gwembe Valley. Greenland has quite recently (1984) shown that floating rice is mostly grown in alluvial and colluvial materials; and experiments in Peru have confirmed the adaptability of floating rice to these types of soils (N.C.S.U., 1983).

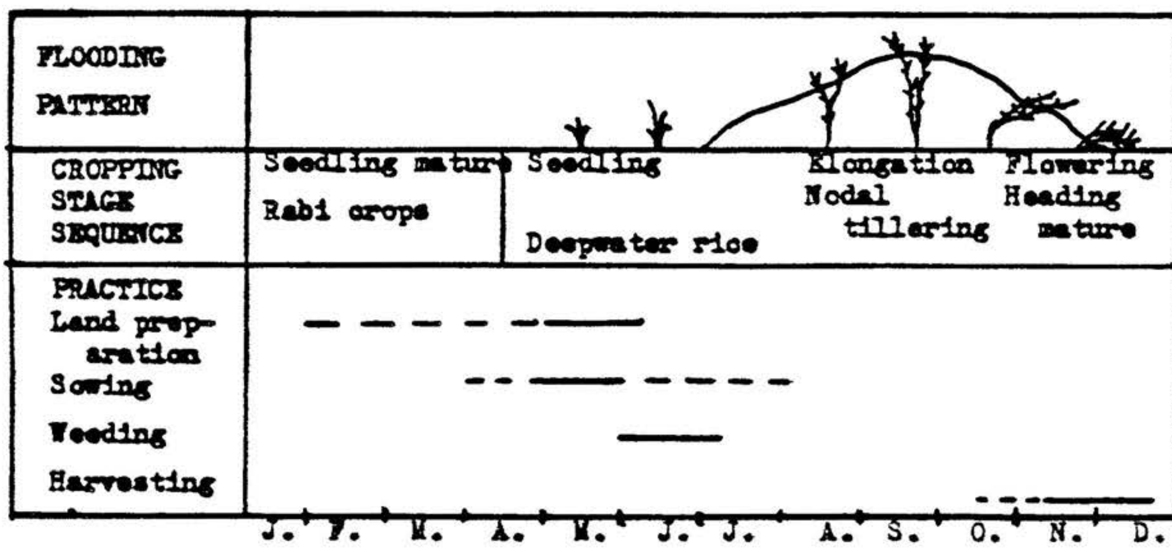
In Zambia trials on deepwater rice varieties are already under way. Through the auspices of the International Deep-Water Survey, the trials were started at the Zambia National Irrigation Research Station at Nanga, on the Kafue Flats, and at Mongu, on the Upper Zambezi basin (U.N.D.P./F.A.O., 1984). As at present, no trials have been conducted on any of the Zambian lake shores, including that of the Lake Kariba.

The cultivation pattern to be adopted could approximate the one already in use in West Africa and in the monsoon climates of Asia. However, in Lake Kariba situation, we have to bear in mind that the lake is presently regulated mainly to suit H.E. generation interests. Thus, we have to suit our cultivation pattern to H.E's. designs.

The typical monsoon deepwater rice agronomic practices have clearly been shown by Catling et al, 1983 (Figure 6:7). The land is prepared and rice seedlings are planted long before the floods occur from June to October. The weeding has to be done just as the crop is being inundated.

From June to October, the crop is submerged in water. From September to December, harvesting is done. They start with the early maturing varieties which ripen before the water has started to recede. Thus, the early harvesting is carried out from boats. However, the main harvesting period for most varieties is from the end of October to early December (Catling, et al, 1983). The land is then left fallow for about three months up to March, when land is again prepared for the coming season. Lying almost within the same latitudes 10 - 20°N, in the West African countries (Table 6:1) that deepwater rice is grown, the monsoon type of cultivation pattern is used. This is mainly because the rainfall pattern in West Africa follows that of the Far Eastern countries, and they have their own monsoon type of rainfall (Ledger, 1969). Though flooding does not occur instantly on all areas and that it tends to be too site specific according to the river's hydrology (ibid), it can still be appreciated that it generally floods between August and November (Vallee and Voug, 1977); and the flood starts receding any time after October (Toure, et al, 1982). In appreciation of this hydrological pattern, the rice is planted at the beginning of the first heavy rains, mainly between April and July. It is then left to be rain-fed until the flood water arrives. Thirty to forty days have been seen to be

Fig. 6: 7 Flooding Pattern, Cropping Sequence, and Agronomic Practices for Deepwater Rice Areas of Bangladesh



Source: Catling et al (1983), p. 111.

Table 6:1 Deepwater Rice Cultivations in West Africa. Hectarage and Yields

Water Status	Area Covered (ha.)	% of Total Rice Area	Countries	Average Yield (tonnes/ha.)
No water control	506,000	22	Mali, Niger, Nigeria, Senegal, Gambia, Sierra Leone, Guinea, and Guinea Bissau	1.0 - 1.5
Partial water control (dam or polder)	69,000	3	Mali, Senegal and Nigeria	1.5 - 2.0

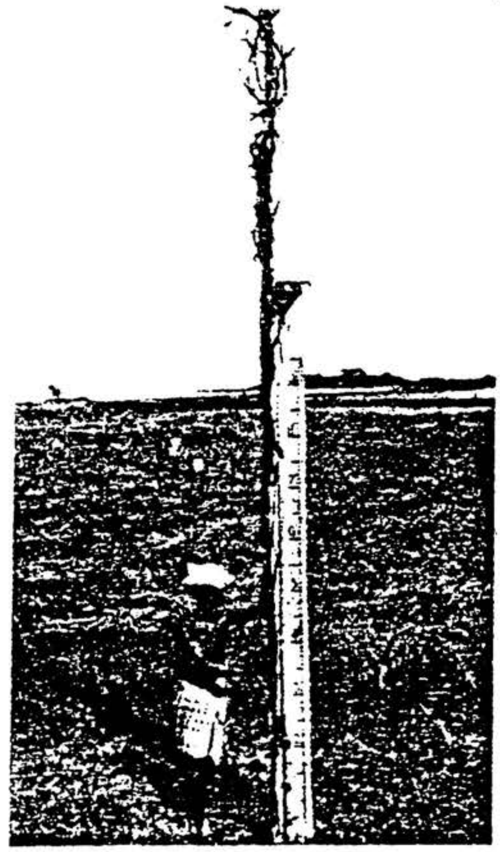
Source: Toure, A.I., et al, 1982, p 104.

the minimum period necessary from the date of sowing to the arrival of the flood water (Jordan, 1966; Chabrolin, 1977; Bhan, 1983).

The rice plant elongates as the water level rises so as to allow the tip of the plant to be above the water level as much as possible (Grist, 1975). Some varieties grow as much as 500 mm in four days (ibid); and the planting of rice tends to be spatially distributed so as to suit a variety which will suit a particular ecological zone (Grigg, 1974). The varieties which suit very deep water conditions and which can also be in water for much longer periods are planted early, in the lowest water levels of a particular hydrological area; and those which do not require much inundation are planted later, where the flooding period tends to be shorter and the depth shallower (Ramiah and Ramaswami, 1941; Chabrolin, 1977; Toure, et al, 1982; Catling, et al, 1983). Varieties which grow in water depth of about 6 metres (Figure 6:8) have been identified (Ramiah and Ramaswami, 1941; Jordan, 1969; Grist, 1975; I.L.D.C., 1981). The rice plants are submerged in periods ranging from 2 to 6 months (Grist, 1975; Chabrolin, 1979). However, this does not affect the harvesting of the crop. Some early maturing varieties can be harvested during the flood period. The use of boats when harvesting the crop is not uncommon (Harlan and Pasquereau, 1969; Jordan, 1969). The task has now been made easier with the development of a floating rice harvester (Rice Journal, 1971).

However, the fact that the rice seed is planted with the commencement of heavy rainfall, and with the anticipation of a coming flood regime, makes the system precarious (Vallee and Vuong, 1978). Rainfall in much of the Tropical environments tends to be very uncertain, both in intensity and distribution; and both in time and

Figure 6:8 A Typical Floating Rice Plant grown in Habiganj, Assam.



Source: Ramiah, K., and Ramaswami, K. (1941) Figure 1 spatial distribution. This, in turn, results in uncertainty in time of flooding and the magnitude of its regime.

Catling, et al (1983), in a research experiment in Bangladesh, found that erratic rains produce poor seedling stands and also that severe drought delays sowing, which would lead to the germination of weak seedlings which tend to be susceptible to flooding stress; and, if rains come too late, after sowing has already been done, germination is hampered (Grist, 1967).

The lack of control over the hydrology of the rivers, whose flooding allows the cultivation of floating rice, happens to be one of its major limiting factors. According to Harlan and Pasquereau (1969):

> "Floods may be too high, too low, too early, or too late to be ideal" (p 71).

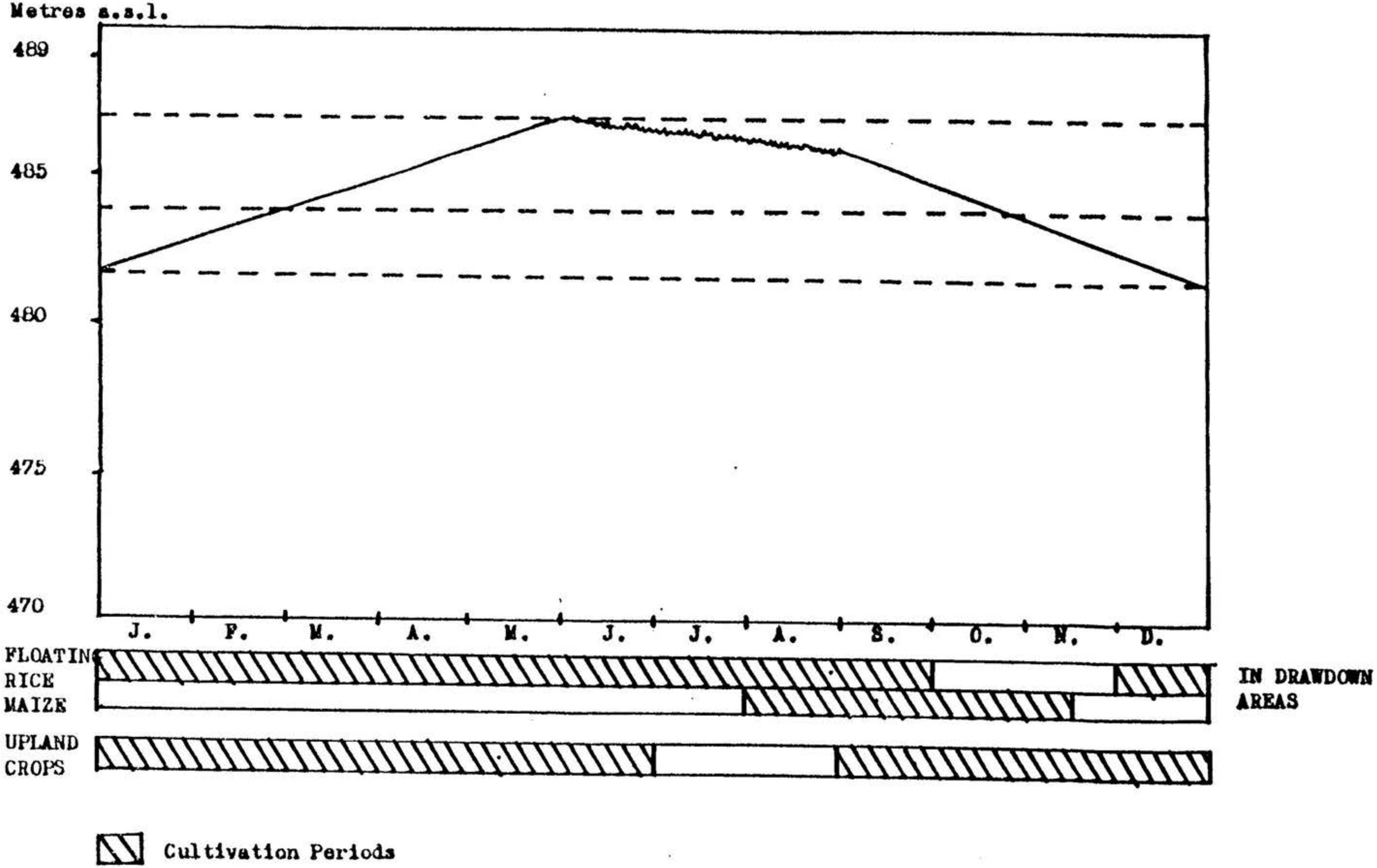
Actually, the amount of land available for floating rice cultivation depends on the height of the water level as well as the extent of land covered by the flood. The gradient of the flood plain and the rate of flooding also matter. In periods of maximum floods, more land is inundated and thus open for cultivation; and in times of minimal flooding, the land for cultivation is also restricted. Since these factors tend to be too situational specific, the cultivation system adopted has also to be able to adjust to chancy situations (Webster and Wilson, 1966; Harlan and Pasquereau, 1969; Ledger, 1969).

These experiences in the Asian monsoon climate and in some of the West African floating rice cultivation areas clearly highlight the flaw in the agricultural use of the flood plain (or drawdown areas), without any form of monitoring and regulating the flood and the fluctuations which determine the extent and efficiency of the agricultural system. It is the contention of this thesis that the technological capacity at Kariba Dam to monitor and regulate the lake level could, with some minimal adjustments and co-ordination, accommodate and enhance the lacastrine communities' agricultural use of the drawdown areas. Indeed, in Mali, the Niger and Bani Rivers have been controlled in such a way that the arrival of floods into the rice fields is delayed, and the flow is regulated to rise 5 centimetres per day, to a predetermined level, and its fall later in the season is also delayed accordingly (Vallee and Vuong, 1978). Even rises of water level of about 15 centimetres per day have been seen not to be particularly damaging to the rice crop (Moormann and Veldkamp, 1978).

Now we can attempt to integrate, hypothetically, the agricultural use of the drawdown areas, into the operations of the Lake Kariba in the past twenty-five years.

We shall adopt the cultivation system used in the Asian monsoon climate and West African floating rice growing areas. Thus, the rice would be planted, mainly in December, when the lake level is at its minimum levels and the rains have just started. The seedlings would be rain-fed until the lake level starts rising from January on. The crop would then be under submersion until late July, when the lake level starts to recede gradually. The crop could then be harvested as the ground gets exposed. If possible, the crops grown in deep, low zones could be harvested from boats a bit earlier. Figure 6:9 depicts this hypothetical situation.

Fig. 6: 9 Integration of Upland and Drawdown Cultivation Systems into the Design Fluctuations of the Lake Kariba Water Levels: a Hypothetical Case



Adapted from Fig. 6: 1.

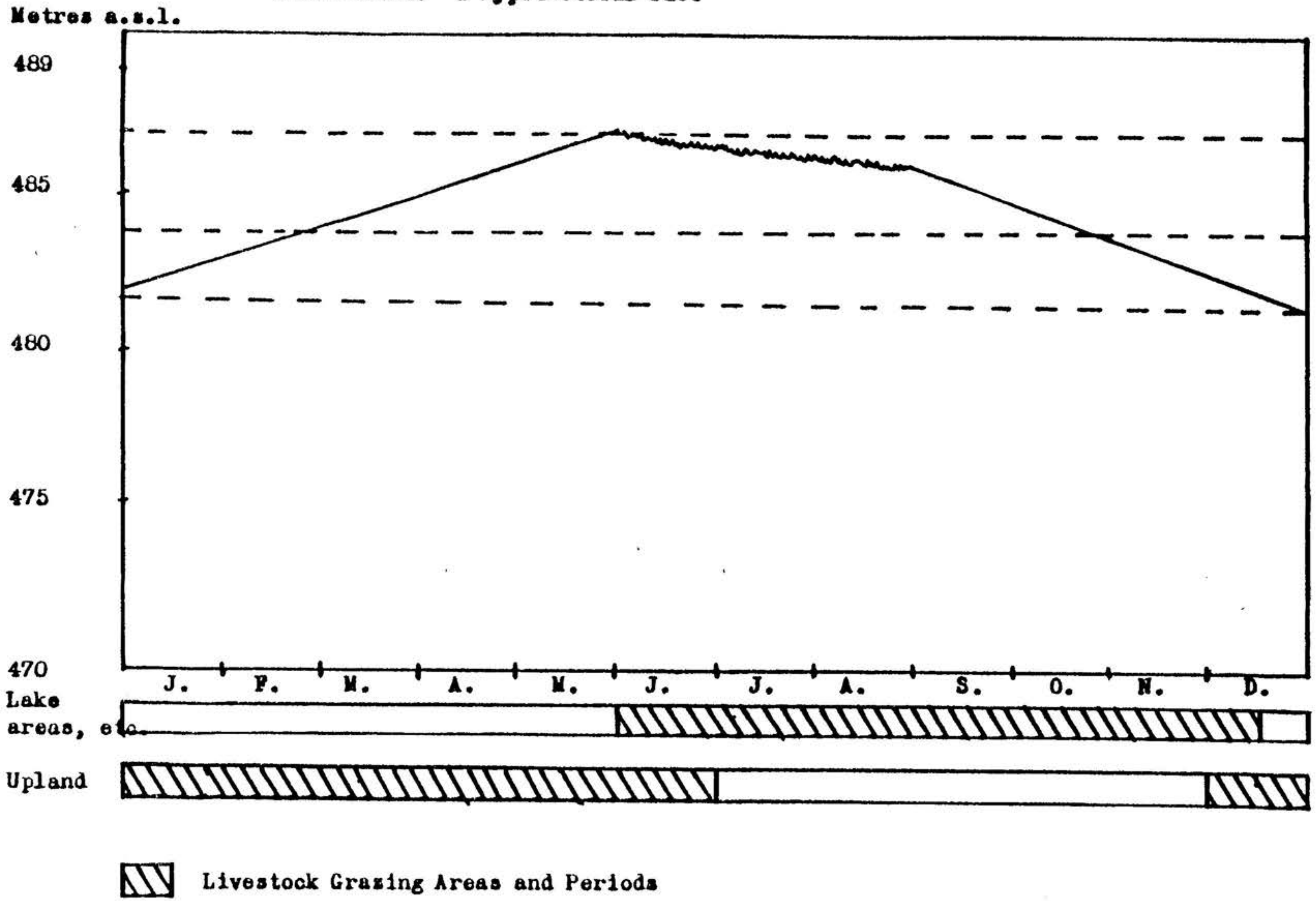
The position of livestock should also be considered. Unfortunately, in most floating rice growing areas, livestock rearing does not feature as one of their major agricultural activities (Gourou, 1948; Grigg, 1974). Moreover, untreated rice husks are not recommended for livestock feed because of their high silica content and low nutritive value (Stampa, 1941; Clawson and Garrett, 1970). In fact, in areas where animals are also kept, alternative pasture is given (Webster and Wilson, 1966).

In Gwembe Valley, livestock rearing is very much entrenched in the socio-economic fabric of the people. Thus, we cannot afford to preclude its involvement in our hypothetical situation.

In our discussion of the grazing problems in this area, we saw that the late dry and early rainy season was the most acute period as far as the scarcity of grazing areas was concerned. Thus, in our model, we shall need to find ways of resolving this conflict rather than extending it, as is often the case in most water manipulation interventions (Odingo, 1977).

Even though we saw that maize cultivation cannot easily be integrated to the Lake Kariba fluctuations, the fact that the farmers are already cultivating an appropriate variety, the local maize Kaile, cannot be ignored. Moreover, if it is planted between July and August, when the lake is relatively stable but receding gradually, the maize stalks could be an optime feed towards the end of the year. As the lake rapidly recedes from September on, maize cultivation would be restricted and the local shrubs, which were seen as being good grazing grass, could be let to grow wildly and widely. In this case, floating rice cultivation would be rotated with maize

Fig. 6: 10 Integration of Livestock Rearing into the Design of the Fluctuations of the Waters of Lake Kariba: a Hypothetical Case



Adapted from Fig. 6: 1.

and the wild shrubs very much in line with the lake fluctuations (Figure 6:10).

The regulation of the lake offered by the Kariba Dam and the capacity to monitor the coming flood enabled by the Flood Warning Control System would mitigate against erratic flooding and sudden rapid lake recession. For example, the sudden rise of the lake level by almost 2 metres (Figure 6:2D) between December and January in 1977/8 hydrological year would have been catastrophic if this model was in use. Farmers would not have finished sowing their rice plants, and the sudden increase in the depth of the water would have drowned the early planted seedlings; and the livestock would have immediately been pushed on the upland, where scarcity of grazing land when rain-fed crops are being grown is already apparent; and when there is a delay in lake rise, as happened in 1976/7 hydrological year, when the flood came in February, farmers would have been required to replant at the time when they are weeding their rain-fed crops. The demands on labour would be too severe. On the other hand, if the regulation of the lake had any consideration for the agricultural use of the drawdown areas, the lake could be allowed to fluctuate in such a way that the interests of the agriculturalists are not disastrously affected. However, if the situation is such that the interests of H.E. generation require the lake level to be changed suddenly, the cultivators need to be advised accordingly. The important issues are predictability and confidence in the lake's behaviour. We have seen in this discussion that, in the pre-dam era, farmers used to predict with some certainty the flow pattern of the Zambezi River floods. They had their own indicators. Though they could not control the flood, they had some confidence in the agricultural use of the flood plain. In the same vein, the use of the flood warning control system and the capacity to regulate the lake level could mitigate against the risks involved in the old system; and, in a way, it could allow people living in such environments to make use of this resource with some certainty.

Summary and Conclusions

In this chapter, an attempt has been made to review the hydrological operations of the Lake Kariba in terms of its impacts on the agricultural use of the drawdown areas. In as far as the lake fluctuations are concerned, it has been demonstrated that they do not necessarily follow the designed pattern. In fact, C.A.P.C.O. has, in the past, regulated the lake level to suit other interests which are not necessarily connected to the Kariba Dam H.E. Scheme. This clearly demonstrates the capacity and willingness of C.A.P.C.O. to share its technological capacity to monitor the flood and regulate the lake level with other interests, so long as H.E. generation requirements are not compromised. Indeed, the data that C.A.P.C.O. acquires through the use of the flood warning control system is widely distributed both in the riparian countries of Zimbabwe and Zambia and in the downstream areas of Mozambique.

In the discussion of the agricultural activities based on the lake shoreline, it has been shown that the two irrigation schemes, that is Buleya Malima and Siatwiinda, their water pumping designs limit their operations whenever the lake level goes below the expected minimum levels of the lake. This has been seen wanting because the times that the lake level drops too low happen also to be times of severe drought and thus food shortage. It is supposed to be these times that the use of water from the lake could assist in the cultivation of food crops. Nevertheless, these schemes' experiments with rice have offered a crop which could be considered in the agricultural use of the drawdown areas.

In our discussion of the local people's agricultural use of the drawdown areas, we described it as a spontaneous response. It is chancy because the cultivators do not use it with any certainty. The lake fluctuates without any regard to them. Thus, they do not know when and why the lake is taking any fluctuation trend. Despite these drawbacks, the local people have experimented with a local maize variety which has suited the lake's fluctuations. However, the timing of cultural practices seems to conflict with those of the upland areas. Paradoxically, the use of the drawdown areas for livestock rearing has been seen to be offering a good grazing field at a period when livestock feed is supposed to be scarce; and it has also, to some extent, eased the conflict on land use between livestock rearing and upland crop cultivation, especially towards the end of the year.

From these experiences (lake fluctuations, smallholder irrigation schemes' experiences, and the local people's use of the drawdown areas), an attempt has been made to integrate agricultural activities into the operations of the Lake Kariba. Even though rice has already proved its suitability to Gwembe Valley conditions, we have seen that the variety presently grown in the irrigation schemes cannot successfully be grown on the drawdown areas, if we have to make use of the lake fluctuations. Thus, we have adopted the cultivation of floating rice as is practised in the Asian monsoon climate and some of the floating rice cultivation countries in West Africa. Since rice husks are not good livestock feed, the growing of the local maize variety, immediately the lake starts to recede, has been seen to be offering maize stalks as animal feed when the crop has been harvested. If conditions do not allow, especially as it relates to upland cultivation requirements, we have concluded that the grasses which grow in the drawdown areas, already seen to be good as pasture, could be let to grow wildly and widely. Thus, livestock interests are accommodated in the whole eco-system.

For this paradigm to be used, there is a need for strong co-ordination between the lake monitoring and regulating agency, C.A.P.C.O., and the agency in charge of agricultural extension in the area, G.S.D.P. The former is a bi-national public enterprise (Zimbabwe and Zambia collaboration) and the latter is a regional development project, implemented under the Zambian government and the Gossner Evangelical Mission agreement. Thus, their co-operation requires an understanding of their operation norms. This is the theme of our next discussion.

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CHAPTER SEVEN

Institutional Issues

The Gossner Evangelical Mission: the Building of Local Non-Governmental Organisations, and the Management of the Lake Kariba Regulated Agriculture

Apart from the preoccupation with technological matters, another issue which attracts a lot of academic interest but still poses acute problems among agricultural or rural development planners and practitioners alike is the nature of the institutional framework within which the technologies could be developed or diffused (Kotter, 1974; Ruttan, 1975, 1978; Scheider, 1981). The issue is magnified when it is applied to the small-farming sector. Here, technological and institutional issues have mostly been seen as distinctive activities. It is mostly in large-scale agribusiness enterprises that technological and institutional matters tend to be treated as components of a single effort (Dinham and Hines, 1983).

These seeming distinctions between technological and institutional matters tend to be reinforced by the professional backgrounds of the participants as well as the orientation of the institutions that they represent. Whilst people with engineering or physical backgrounds concern themselves with issues such as hydrology, agronomy, pedology and so on, those with a social science background tend to concern themselves with sociological, administrative and service organisational issues. Montgomery (1983) describes the latter group as being involved in structural issues. Their preoccupation tends to be in designing appropriate institutions, which will enable the adoption of technologies promoted by the technologists.

Just as there has been less attention given to the development of existing technologies in small farmer development, so also has there been less attention to the diffusion of technologies through existing institutions. Neither has there been much attention focussed upon the evolution of local institutions in respond to the technologies diffused (Seibel and Massing, 1974). Thus, the diffusion of innovations tends also to be associated with the diffusion of institutions (Ruttan, 1978).

In instances where the innovations and institutions are in a combined package, they have been seen to be fostering integrated development in the areas of operation (Rondinelli and Ruddle, 1977); but experience seems to suggest that, in most of the so-called 'integrated projects', what is meant is the "co-ordination of different actions, institutions and administrative systems" (Holmberg, 1977, p 1). Much emphasis, however, seems to be placed on the last two (Leonard and Marshall, 1982). This phenomenon is mostly associated with those projects which are financed and promoted by international agencies. Although these projects have received a lot of academic interest and tend to arouse a lot of anxiety among recipient countries, there is mounting evidence which suggests that there are also other agencies operating on limited budgets and on low profiles which are involved in more appropriate ways of fostering technical change in developing countries. Although there are many institutions falling under this latter bracket, we shall only concern ourselves here with evangelical missions.

Studies which have looked at the work of evangelical missions in fostering technical change reveal that their contribution, though humble, is not insignificant (Maddox, 1956; Abrecht, 1961; Burnham, 1980). Maddox (1956) sees evangelical work as being of two types: the first type is that which is mostly concerned with the spreading of the gospel; the second type is mainly concerned with the improvement of man's welfare on earth. Whilst the former type is more popular, there tends to be, in most of the missions, some attributes of the latter as well. In fact, the patience that gospel-spreading demands makes the evangelical missions develop deep-rooted associations with the societies in which they operate (Sartorius, 1975; Hamer, 1976). Thus, they tend to be able to understand the grass-root situation better, allowing them to provide a more locally accepted leadership or inspiration - attributes which are of vital importance in the initial stages of development (Mahon, 1969; Ruttan, 1978).

In this chapter, we shall attempt to review the institutional framework devised by the Gossner Evangelical Mission in Gwembe South. We shall then make comparisons with other regionally-oriented development efforts in Zambia. From this perspective, we shall try to suggest how an institutional framework in which the agro-hydrological paradigm, discussed in the last chapter, could be more effectively installed. The essence of our argument is to exemplify the importance of using existing, or locally evolved, institutions whenever technologies are being improved, developed and diffused at any particular moment in time and space (Hollnsteiner, 1979; Korten, 198 ; Biggs, 1981; Scheider, 1981; Fortmann, 1985).

The Coming of the Gossner Evangelical Mission to the Gwembe Valley

As we mentioned in chapter five, the Gwembe South Development

Project (G.S.D.P.) is implemented under a bilateral agreement between the Gossner Evangelical Mission (G.E.M.) and the Zambian government. The project was initiated in 1970.

The G.E.M. were invited to work in Gwembe Valley, by the Zambian government. The request was accepted, mainly because the type of work involved in the resettlement programme was compatible with the G.E.M's. resolve on human development. They believe that man's spiritual happiness should evolve from his earthly pursuits (Schaffer, 1984). In this regard, they fall into that bracket of evangelical missions which Maddox (1956) categorises as being mainly interested in man's earthly happiness. In fact, the World Council of Churches already emphasised in 1928 that evangelical missions working in developing countries should direct some of their energies to the improving of the living standards of people living in rural areas (Abrecht, 1961). In our discussion of the coming of evangelical missions to the Gwembe Valley in chapter three, we showed how difficult it was to convert the Gwembe Tonga. Colson (1971) shows that the spread of the gospel met resistance mainly because it was seen by the people as being incompatible with the indigenous religious beliefs. She has demonstrated how the local religion integrated spiritual and material factors. Thus, she deduces that any gospel which insisted on the separation of the two could not easily be adopted. In fact, when the British South Africa Company invited the missionaries to work among the Gwembe Tonga, it expected them to teach the people modern methods of agriculture (Rotberg, 1965). Thus, when the missionaries established themselves, their teaching was not restricted to religious subjects, but included other branches of knowledge as well (Westermann, 1935). Hence, the Gwembe people's initial acceptance of medical facilities and educational institutions before evangelical indoctrination (Scudder and Colson, 1980). Norman Long (1968a; 1968b) notices the same phenomenon among the members of Jehovah's Witness in Serenje District in Central Province of Zambia. The church actually encourages its members to acquire technological skills so as to improve the living standards of their families.

Before coming to the Gwembe Valley, the Gossner Evangelical Mission (G.E.M.) were already involved in rural development work in Asia. The mission started sending development experts to Chotanapur in India from the end of the Second World War. Later, the mission became involved in the promotion of community health service in Nepal. This background gave the Gossner Evangelical Mission some precedence in rural and agrarian problems of developing countries; and the presence of well documented sociological and ecological monographs, on the Gwembe Valley, by Elizabeth Colson (1960) and Thayer Scudder (1962) respectively, provided some background information which the Gossner mission made use of, in their appreciation of the request, to work in Gwembe Valley, from the Zambian government.

But, before we proceed with the discussion on the type of institutions that the Gossner mission developed in Gwembe South, we need to recall this area's administrative background. In our discussion of the pre-damming period, in chapter three, we noted that the earliest administrative post in the valley was opened in 1902. We clearly demonstrated that the main purpose of opening this post was to collect hut and poll taxes. The force behind the taxes encouraged people to emigrate for wage employment in white settler enclaves in Southern Rhodesian agricultural and industrial enterprises, and later in the Northern Rhodesian 'line of rail' farming areas, and in the copper mining towns of the Copperbelt. In that same discussion, we also showed how the administrative system enforced the drought relief, Granary and Cassava Orders. Although the general public resented the orders, the administration used very punitive actions to implement them; and, in the resettlement episode, the same administration assumed the responsibility of resettling people when their original lands were inundated.

We can thus realise that, from the time of the opening of the first administrative post to the time of resettlement, the administration service was an instrument applied by the colonial administration to the control and cohesion of the local population. Therefore, it was generally regarded with animosity (Colson, 1971).

The gaining of Zambian independence in 1964 did not, unfortunately, seem to have affected the Gwembe people's feelings towards the state machinery. This was largely due to the fact that the party, the African National Congress (A.N.C.), which had articulated the views of the Gwembe people during the debate on the Kariba Dam, lost the first general elections to form a government; and the United Nation Independence Party, which had limited support in the area, won (King, Jr., 1967; Colson, 1971). In the second general elections in 1978, again, A.N.C. failed to win enough votes to take over from U.N.I.P.; and the situation was further complicated in 1972 when the ruling Party (U.N.I.P.) declared a One Party State and A.N.C. and other parties subsequently ceased to exist (Pettman, 1974).

The Zimbabwean wars of liberation also played their part in weakening the government's position in the Gwembe Valley. Lying upon a border, and for that matter the frontline zone between majority-ruled states to the north of the Zambezi River and those on the south, the region was a buffer zone. During the course of the war, the Zambian government allowed the Zimbabwe African People's Union (Z.A.P.U.) to set up guerrilla military bases in this area. Thus, whenever the Southern Rhodesian military forces crossed the lake to attack the guerrilla bases of Z.A.P.U., Zambian nationals also were affected. In fact, even the government itself reduced its development work. It was even difficult to retain the minimum government services, as most government officers ran away and refused to be posted there (Scudder, M.R.D., et al, 1982). Paradoxically, the Gossner mission came to Gwembe Valley when the liberation wars were being initiated. They withstood the war inferno during the mid-70's and stayed on until after the war ended and the diplomatic relations between the Lake Kariba riparian territories (of Zimbabwe and Zambia) were restored.

Administrative Set-Up and the Building of Local Non-Governmental Organisations

According to the first (1970) Agreement for Technical Co-operation Between the Government of the Republic of Zambia and the Gossner Mission of Berlin, Germany, the project to be established in Gwembe Valley had to operate under the umbrella term of Gwembe South Development Project (G.S.D.P.). They were to start in Gwembe South. It was expected that, as experience was generated, the project would expand to Gwembe Central and subsequently Gwembe North.

The agreement specifies that the technical experts provided by the G.E.M. were to work:

"under the direction of the Gwembe Valley Co-ordinating Committee, to be appointed by the Government of Zambia, and who will also appoint such executive officers as shall be required for effective utilisation of the material and expert personnel by the Gossner Mission" (ibid, p 1).

The project was to be headed by a Co-ordinating Officer to be appointed by the Zambian government. His main function was to co-ordinate the work of all government institutions involved in development projects in this area. The officers of these government departments were to compose the Gwembe Valley Co-ordinating Committee membership. This was to be the main policy and planning body of all activities to be undertaken by this co-operation. The Government of Zambia committed itself to provide the finance for the execution of the planned projects.

In spite of this preparation, when the first G.E.M. team arrived in the Gwembe Valley, they found that the Co-ordinating Officer was not yet appointed; and, to their dismay, they discovered:

"The local government departments had not been informed about the arrival and functions of the expatriates" (Buntzel, 1982, p 4).

The dearth of the policy making and planning body meant that there were no immediate, ready projects on which the G.E.M. could have started their work. However, since they were already in the field, they went ahead to plan and implement projects, based on their own experience. Presumably, because of the presence of the Kanchindu Mission at Chief Mwemba's village, the G.E.M. team established their initial base there rather than at Sinazongwe, where the sub-district administrative office is situated. Thus, most of their projects tended to be started from there and later they spread into surrounding areas. These experiences seem to approximate to what Hamer (1970) observed among the Sidamo in Ethiopia. He concluded in his study that religious converts seem to be the most receptive to economic and social innovations. As such, Christian sections tend to be looked upon as standing more definitely on the side of 'progress' (Westermann, 1935).

Even though the G.E.M. technical assistance personnel already in the Gwembe Valley involved themselves with some micro projects, it seems the Board of the G.E.M. was not very happy about the whole situation. In order to direct their work more properly, the Board requested the Germany Development Institute (G.D.I.) to carry out a regional development plan for the Gwembe South; but for the exercise to be executed the Zambian government approval was required. This was given in 1971 and the report was published in 1973.

The G.D.I. report was comprehensive (chapter five). Nevertheless, in actual content, it merely endorsed what the G.E.M. team had already initiated. The G.D.I's. report contribution was to put the work already in progress into the development planning context. Paradoxically, from 1970, when the first G.E.M. team came to the valley, and 1973, when the G.D.I. report was submitted for consideration amongst the parties involved (G.E.M. and the Zambian Government), the economic situation in Zambia and the political atmosphere in the Southern African region had all changed. The price of copper had fallen sharply in 1971. This occasion severely constrained the government's financial commitments. Before the price fell, copper used to:

"provide 60 per cent of government revenue, almost all the foreign exchange earnings and nearly half the total national income" (Martin, 1972, p 117).

The shortfall in foreign exchange earnings forced the government to purchase the first off-set fund from the International Monetary Fund (I.M.F.) (Seidman, 1974). The fund was given with the condition that the government had to cut severely both its capital and recurrent expenditures (Pettman, 1974; I.L.O., 1976). Projects in the Gwembe Valley were certainly affected (Table 5:1).

As we have already mentioned, towards the mid-70's, the Zimbabwean wars of liberation came to be intensified; and the security of the Gwembe Valley was too sensitive. Thus, government development work had to be reduced. So it seems that the G.D.I's. proposals were not seriously considered with a view to changing the operations already set in motion by the G.E.M.; they continued to work as before.

Gwembe South Development Project (G.S.D.P.) Structures

Due to the factors just described, the G.S.D.P. has not had any noticeable organisational structure; but this does not mean that there were no institutions. Indeed, there were. They seem, however, to have been associated with particular activities promoted by the G.E.M. technical officers. At least up to 1983, the G.S.D.P. did not portray itself as a coherent institution.

The absence of any plan and an institutional head meant that technical officers could initiate any project that they saw fit. Where the situation allowed, the government seconded some of the field staff to work as counterparts, though in reality they were assistants. The arrangement depended much on the rapport that a particular officer developed with existing institutions. Even though the Agreement between the G.E.M. and the Zambian government specified that the former was to appoint one of its officers as a team leader, it seems his functions were more to do with the personnel matters of the G.E.M. officers. He was really not much concerned with what went on in the field. As such, the post of team leader did not, in effect, assume the responsibilities that befell the post of Co-ordinating Officer. As a result, there does not appear to have been any formal co-ordination of G.S.D.P.-promoted activities. Even the relationship with other government institutions was not very clear. The only firm link that existed was on the flow of funds from the government. As a regional development project with no expectation of expanding to other provinces of Zambia (it could expand only within Gwembe District), its funds came through the Land Use Branch of the Department of Agriculture (Birgegard, 1975).

Consequently, with the only exception of the agricultural oriented project components, there does not seem to be any set pattern on project planning and promotion. This is more marked with those activities which are of a community development nature. Most of the community development activities were initiated and discontinued at any time during the period under review (1970-1983). Although the project reports seem to exhibit a lot of euphoria when projects are initiated, the enthusiasm tended to wane over time.

Incidentally, as some of the activities under G.S.D.P. dropped off from being purely under government control, they reappeared under the direction of local institutions. In our evaluation of the G.S.D.P. in chapter five, we demonstrated the involvement of farmers in the management of the irrigation schemes. Nevertheless, the existence of the farmers' executive committees does not really indicate that the farmers control all the functions of the schemes. There still tends to be a continuing government influence through the presence of government agricultural officers occupying the posts of 'Officer-in-Charge'.

In our discussion of the development of the savings and credit unions in the Gwembe South, we clearly showed how the registration of the Siatwiinda union resulted in the discontinuation of the marketing service that the union provided to the irrigation scheme. The linkage with the national body affected the union's appreciation of the local situation. Since there is no bank in Gwembe South, the members of the savings union envisaged that they could boost the finances of the union by engaging in the selling of produce. However, the national regulation regarding savings unions does not allow them to engage in cash generating activities. Once registered, they had to follow the national policy.

Apart from the building of these institutions, which are more linked to the irrigation schemes, G.S.D.P. has also encouraged the formation of service provision institutions outside the web of government. These have developed, not necessarily by design, but mainly by the situation prevailing at the time.

The first non-government institution to be formed with the assistance of G.S.D.P. was the <u>Gwembe Builders' Co-operative Society</u>. This grew from the construction activities of G.S.D.P. After the construction of the staff houses and the construction of the physical infrastructure at Siatwiinda, there seemed not to be much need for a construction team. However, since the Siatwiinda Scheme was seen as a pilot scheme, in that the lessons gained might necessitate the expansion of the scheme, it was felt that it was advisable to retain the building team. Moreover, the G.D.I. study had suggested that a local brick-making industry could develop and these would be demanded by the expansion of the service infrastructure in such fields as schools, clinics, houses, and so on. With the expertise generated during the construction of the projects under the G.S.D.P., the building team had become the only local experienced building group. Since being under G.S.D.P. meant being in government, they could not undertake projects which were not under the government sponsorship and, if there was no government construction project, they had to disband. In order to preserve the resource, the G.S.D.P. therefore decided to encourage the team to form a builders' co-operative. The G.E.M. was to support this co-operative with the appointment of a building engineer and the finance of a locally recruited building supervisor.

From the time of formation, the Gwembe Builders' Co-operative Society has undertaken most of the physical construction projects, under government sponsorship, in the Gwembe South. It has also, at times, been engaged by the Maamba Colliery on some of their projects. At the moment, the Gwembe Builders' Co-operative Society bids for tenders like any other private construction firm. Although the G.E.M. is still providing technical assistance personnel to this co-operative, and although the co-operative tends to be affected whenever there are no jobs to be undertaken, it is generally agreed amongst the observers of the G.S.D.P. that the existence of the builders' co-operative has indeed created employment opportunities in the area and, more importantly, that the skills generated during the construction activities have remained active and available in the area (Buntzel, 1980; Scudder, et al, 1982; Banda, 1983). Since some of the members are also farmers in the irrigation schemes, they have in most cases also used their expertise in the maintenance of the scheme canals.

Amongst all other activities that the G.S.D.P. have promoted in the Gwembe Valley, it is the building of the Valley Self-Help Promotion Society (V.S.P.) that has most earned them great respect in the area. As we have already shown, under community development, a number of projects were started and discontinued. Some of them could not survive if run on the government framework. This was more so with those activities which had an element of cash generation. For example, in an effort to boost cash generation activites in the villages, the G.S.D.P. officers used to buy crafts products which they sold in Lusaka. As the demand for crafts grew, it became necessary for the enterprise to be institutionalised. The other hurdle was that, if the scheme operated under government aegis, the money generated had to be deposited with the Treasury; it could not possibly be ploughed back into the scheme. Another problem faced by the G.E.M. officers was that, as an evangelical mission, well-wishers in Europe, mainly in the Netherlands and West Germany, used to send second-hand clothes to assist the G.E.M. in their work. Instead of distributing them free-of-charge, they thought of selling them cheaply and the money realised was to be used in the self-help schemes. Again, as a government department or scheme, they could not use money accrued. Thus, to circumvent government regulations, they encouraged the main interest groups in Gwembe South to form a self-help society which could handle this type of enterprise. The groups involved are the traditional chiefs, church leaders, U.N.I.P. Party leaders, members of the Farmers' Executive Committees and some local notables.

The Valley Self-Help Promotion (V.S.P.) was formed in 1979. It is registered as a society. It is governed by a general meeting which elects the executive committee. The membership of the general meeting is drawn from the local institutions. The executive committee decides on the type of activities to be undertaken (new and on-going) and it also employs the secretariat, which is headed by a co-ordinator. The G.E.M. provides managerial assistance to the secretariat.

Since the organisational structure of V.S.P. is much nearer to the grass roots, and since the membership is locally recruited and operates without any referral to any institution or body based anywhere beyond the Gwembe South, it has tended to operate within the needs and capacity that the area has.[1] Most of the activities that V.S.P. supports are based in the more remote areas. That is where crafts are collected, or bought, and that is where, at the same time, items like second-hand clothes, salt, sugar, maize, meal, and so on are sold. In the drought of the past three years, 1981-84, V.S.P. has assisted in identifying needy areas and it has involved itself in the distribution of famine relief supplies. From time to time, the Farmers' Executive Committees hire the V.S.P. lorry to transport their produce to the markets on the 'line of rail'. In 1984, the V.S.P. embarked on a school uniform tailoring programme. It purchased sewing machines and employed tailors to sew the uniforms. Previously, school uniforms could chiefly be bought in Choma, away on the 'line of rail'. Apart from being worn for school purposes,

1. Rondinelli and Ruddle (1977) attribute the success of the Lilongwe Land Development Programme in Malawi, and the Comilla Project in Bangladesh, to the involvement of the local institutions, like tribal leadership, religious groups, etc., from the early beginning. This can be realised if the project plans and implementing institutions have a built-in respect and appreciation of the local institutions.

the presence of easily available uniforms compels parents to spend part of their income on their children's clothing.

V.S.P. has mostly ploughed back its revenue for operating expenses. Some of the cash has been used to purchase materials that are needed on self-help projects. For example, in the construction of clinics on self-help, the community assists in manual labour, but other essentials that are needed have to be bought. In such cases, V.S.P. contributes by providing these materials.

Though V.S.P. has been shown to operate on the wishes of the people involved, it is feared that it is overstretching itself. Most of the commercial activities that it is engaged in cannot even meet the operating expenses. Nevertheless, it was not established to operate on a profit margin, but rather to circumvent some of the bureaucratic and financial impediments that G.S.D.P. faced, running as a government department. The way in which V.S.P. translates the needs of the Gwembe South communities into workable programmes has persuaded Buntzel (1980) to suggest that maybe it would be better to expand V.S.P. and G.S.D.P. as they presently operate to other areas of Gwembe, or else to dissolve G.S.D.P. and have all G.E.M. assistance flow through V.S.P. The issue has not yet been resolved. In any case, it seems the Ministry of Agriculture and Water Development (M.A.W.D.) has opted to give G.S.D.P. an 'Integrated Rural Development Programme' (I.R.D.P.) status. Under this label, it is assumed the work of G.S.D.P. could easily be expanded to the other areas of Gwembe. Before we see the complications of this reasoning, we need to see how other regionally-focussed development projects in Zambia operate. This will give us a much better perspective on how an I.R.D.P. is expected to operate in this area.

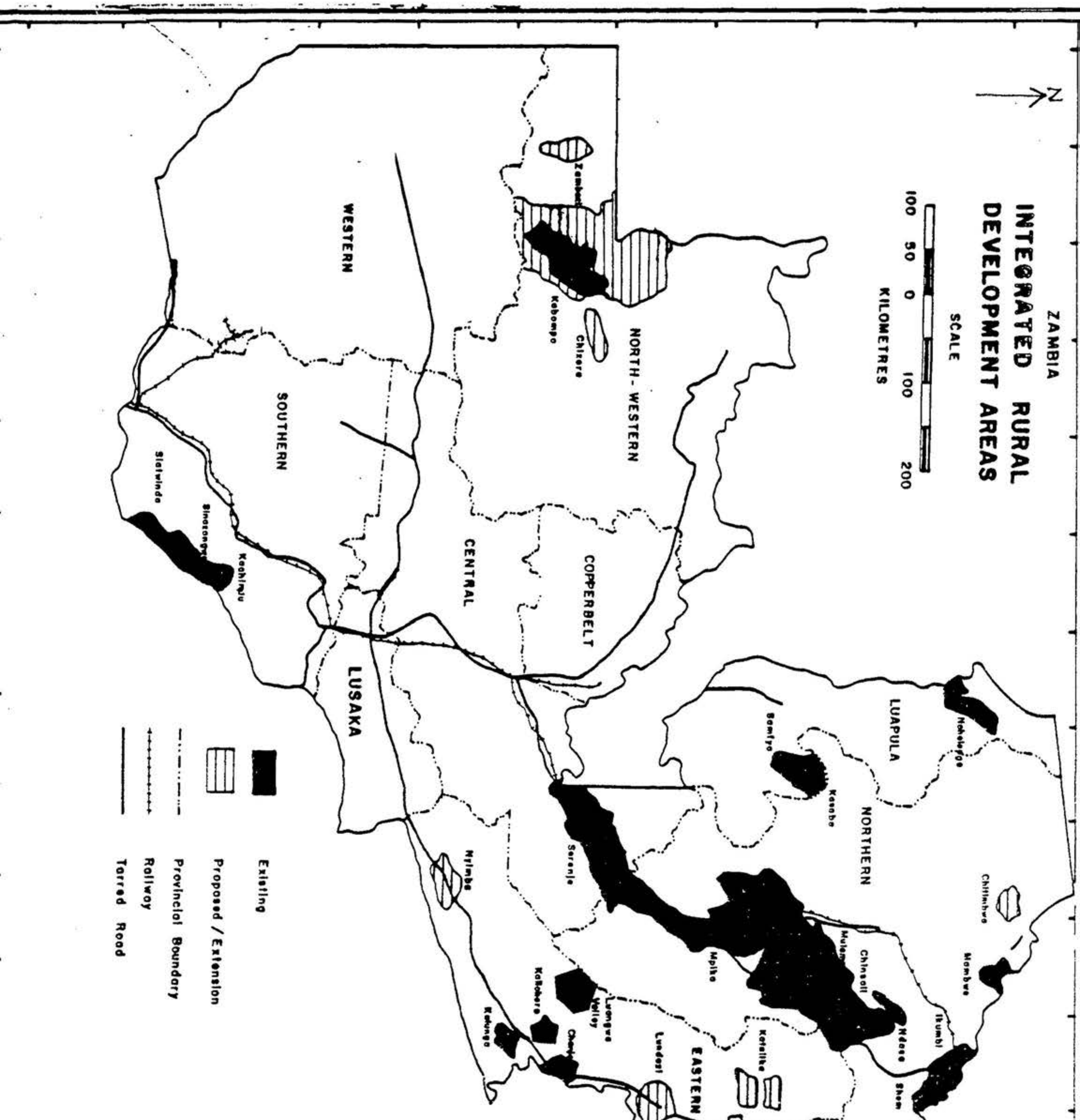
Integrated Rural Development Programmes in Other Areas of Zambia

The major influence on the future organisation of the G.S.D.P. is the experience that the M.A.W.D. has had with other regionally focussed development programmes, which are called Integrated Rural Development Programmes (I.R.D.P's.). Reviews of their development, also, show that they have been adjusting their operating criteria over time (Chipulu, 1981; Mwali, 1981; Zambia, 1984). In this sense, we do not assume that they have a uniform approach. Nevertheless, they tend to exhibit some common characteristics.

At the present time, there are three other I.R.D. Programmes in Zambia. Each one of them is financed and managed by a single donor agency. The oldest projects are sponsored by the Swedish International Development Agency (S.I.D.A.). These are in Eastern Province, Northern Province and Luapula Province. In North-Western Province, the programme is sponsored by the German Technical Co-operation Agency (G.T.Z.); and the British Overseas Development Administration (O.D.A.) are promoting the programme which stretches from Central Province to some parts of Northern Province. In a sense, one notices a balkanisation of the republic according to source of funding (Figure 7:1).

The Integrated Rural Development Programmes (I.R.D.P.) evolved from Intensive Development Zone (I.D.Z.) programmes. The first I.D.Z. programme was initiated in 1970. The philosophy behind the I.D.Z. approach was mainly that development in densely populated areas with agricultural potential could be accelerated if services to those areas, or rather zones, could be delivered in a package. It was then expected that development would spill over to adjacent areas.

The I.D.Z. concept was endorsed in the Second National Development



Based on Zambia [1984]

Plan (1972-1976). The Plan clearly spelt out what the government expected the I.D.Z. promoters to provide in the pursuit of advancing essential pre-conditions for economic growth. These were supposed to be the provision of adequate:

(a) transportation and other productive economic infrastructure for access to input product and consumer markets,

(b) scale of marketing outlets for zone production,

(c) education and health facilities and services,

(d) servicing of farm needs by public marketing and credit organisations (Zambia, 1979).

The I.D.Z. approach has been seen to be a vindication of the technocrats both in the ruling Party, U.N.I.P., and those in government (Mwali, et al, 1981). They were disenchanted with the co-operative programmes of the First National Development; and the message of Rene Dumont's False Start in Africa (1968), in which he showed the numbing experiences of mechanisation in post-independent states, was still fresh in the minds of many. Thus, most of them pushed for development policies which divorced political dogma from economic growth pursuits. In this regard, they felt that, as far as regional development was concerned, areas of agricultural potential had to be developed first. It was hoped development would spread from these areas.

During the course of the development plan period, the political Party leaders became wary of the impact of the I.D.Z. approach. They saw the programme not only favouring the already endowed areas, but also mostly assisting the well-to-do farmers (Mwali, et al, 1981). Nor was the hoped for spill-over happening. In fact, the gap between the 'haves' and the 'have nots' was widening (Kotter, 1974; I.L.O., 1977). Thus, when the S.N.D.P. was drawn, it called for a modification of the I.D.Z. approach in its operational period. The future policy in respect of the I.D.Z. was to integrate the activities promoted into the regional strategy of the relevant areas. The I.D.Z. projects were to come under the overall Integrated Rural Development Programme. It was envisaged that this adjustment would:

> "ensure consistency planning and implementation within the regional development centres strategy" (Zambia, 1979, p 172).

This strategy was to influence the way in which new projects were to be planned and implemented. Since it is this new approach that is influencing the government's perspective in Gwembe Valley, we need to see how the I.R.D.P's. actually operate.

I.R.D.P. Operational Criteria

In as far as regional development is concerned, the I.R.D.P's. are still intervening in those activities that have a direct bearing on agricultural production. Just like the former I.D.Z's., they are involved in the development of a wide range of services such as opening or improving feeder roads leading to agricultural production areas, crop and animal extension services, development of marketing services and the promotion of co-operative societies. Unlike the I.D.Z., they tend to improve services over a much wider region. Moreover, they have chosen to work in more deprived areas and there seems to be an inclination to work and improve the farming enterprises of the small-scale farmers.

In order to provide a comprehensive package of services in the areas where they operate, I.R.D.P's. have established their own organisational structures.[1] They are headed by co-ordinators. Specialised officers work directly under them. Thus, they work mainly on their own in their 'spheres' of operation. In much the same way as the Gossner Mission personnel interact with existing institutions, some local government officers are seconded to these projects to work as counterparts of the foreign experts. In a sense, the I.R.D.P's. have tended to work parallel to other government departments (Lele, 1975).

In the implementation of their planned work, the I.R.D.P. have been more effective as compared to other government departments. Since they all have external sources of finance, the I.R.D.P. and hence their experts tend to have more operational resources, which allow them to implement most of their projects and meet most of their commitment. Thus, roads have been improved, bridges constructed, new agricultural technologies introduced, and so on. Nevertheless, most of the I.R.D.P's. do not want to commit themselves to recurrent activities, that is, maintenance of the infrastructure and follow-up of the technologies. These are supposed to be a responsibility of the existing institutions. This issue has aroused a great deal of resentment, both among the intended beneficiaries and the existing government institutions. Whenever the decision is made to hand over the recurrent phase of the project to existing institutions, the latter have, in most cases, refused to take over the responsibility. If at all they accept, or if the I.R.D.P. insists in withdrawing, the services provided tend to deteriorate. It is, in most cases, very difficult for government departments to take over an activity where

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1. Mabogunje (1980) sees this phenomenon as juxtapositioning institutions in geographically defined areas.

there is no precedence. Moreover, donor aided projects have, in recent years, tended to recruit highly trained personnel. The technical expertise of the local officers seconded tends not to match that of the foreign experts. As such, a project which needs high technical expertise often crumbles with the departure or withdrawal of the foreign expert. Thus, the farmers' expectations tend to be shuttered.

It was from this background that, when the British O.D.A.-aided I.R.D.P. was initiated, they opted to work, from the very beginning, within the existing governmental institutions. They avoided being directly involved in the actual implementation of any project. In fact, the project plans are supposed to emanate from the normal planning machinery of the districts involved. The I.R.D.P. is an area and not a specific institution. The O.D.A. personnel work in the existing institutions, improving their performance and providing back-up services.

The O.D.A. approach (often referred to as the 'Mpika model') is widely heralded in Zambia as one of the best approaches in regional development projects. Even the Swedish government (S.I.D.A.) supported projects are now trying to shape their programmes on the O.D.A. model (I.R.D.C., 1983). The O.D.A. personnel themselves try to avoid complacency by insisting that their approach is not the final panacea to rural development paradigm (ibid). Nevertheless, the Ministry of Agriculture and Water Development is insisting that other I.R.D.P's. should follow the O.D.A. model (Zambia, 1984). Thus, when G.S.D.P. was given an I.R.D.P. status in 1983, the newly-appointed Planner was asked to plan the I.R.D.P.-Gwembe on this model.

In order to see how the G.S.D.P. would operate on the Mpika I.R.D.P. model, we need to understand the type of administrative structure that exists in Gwembe District. From this perspective, we might be in a better position to assess the applicability of the Mpika model to Gwembe Valley conditions.

Bonwell Chikula (1985) provides a general picture of how the Zambian district administrative structures presently operate. Since the organisation of the administration in Gwembe District is no different to the national operational framework, we shall, at this juncture, borrow heavily from him.

Chikulo (ibid) shows that, since the declaration of a One Party state in 1972, the remaining party, U.N.I.P., has been trying to diffuse its influence into all spheres of public life. The vehicle used has been the control of the Party over local government activities. However, the Party sees its strategy of controlling the local government as a mechanism for fostering decentralisation. This motive was institutionalised in 1980, with the passing of the Local Administration Act 1980.

The main objective of the 1980 Act was to ensure an effective integration of the primary organs of the Party and other local administration units in the district (Chikulo, ibid). The result was the creation of an administrative unit which assumed the integration of both Party and government activities at the district level. In the new structure, the Party was supreme and hence the district administration was to be headed by a political appointee, and the administrative structure itself came to be named a District Council.

The Council is a statutory, deliberative and consultative body, concerned with the determination of broad policy objectives and the critical assessment of development programmes (ibid). In effect, the Council is now the policy making and planning body of development activities in each district. The actual day-to-day administration is performed by the District Secretariat. The membership of the Secretariat is drawn from all former officials of the local government and the Party. The functions of all central government departments now fall under the Secretariat and all the government officers are now members of the Secretariat.

The district heads of central government departments are all supposed to be based at the district council headquarters. In Gwembe District, the district headquarters is now at the Gwembe Boma, on the plateau. However, the office is supposed to transfer to Chief Munyumbwe's area at the foot of the escarpment in Gwembe Central.

Since the district is divided into three regions, namely North, Central and South, there are also, at this level, micro-administrative units. These units are more extensions of the Secretariat wing rather than the Council. There is no apparent political head. The sub-districts are, for all intents and purposes, run by senior administrative officers. Under them are the field officers, that is, agricultural assistants, community development officers, teachers and so on.

In spite of the good intentions of passing the Local Government Act, there still looms a technological and institutional gap between the government machinery and the general public. Mabogunje (1981) demonstrates the existence of a contradiction between the norms of bureaucratic system to which officials belong and the real needs of rural development. The contradiction emerges mainly because bureaucracies, mostly government, emphasise conformity, repetition and reiteration rather than innovation. In fact, government institutions fit the scheme devised by Burns and Stalker (1961) in which they see organisations operating either mechanistically or inorganically. Governments fit the former category, whilst the needs, as well as conditions, in most rural areas are variant. Thus, they require interventions which recognise and hence respond to [illegible] situations (Ruttan, 1975; Brown, 1981; Binns and Funnel, 1983). In most developing countries, government institutions do not seem to extend themselves further enough as to be innovative to suit particular situations (Mabogunje, 1981). Thus, we need to look out of the government system.

In Zambia, apart from the government, the other institution that is supposed to represent the interest of the general public is the ruling Party (U.N.I.P.). However, we have shown in this discussion that, at the moment, the Party structure, as it presently stands in Gwembe South, <u>does not</u> portray itself as an institution which could translate people's needs into workable plans. As we have shown, there is still a big gap between the grass roots (general public) and the level of the District Council where decisions are actually made.[1] Although we do appreciate the O.D.A. (Mpika) I.R.D.P. model, the political and administrative background of Gwembe Valley does not seem to accord an appropriate atmosphere. Neither does the environmental situation in this area seem to be well appreciated by the existing political and administrative institutions.

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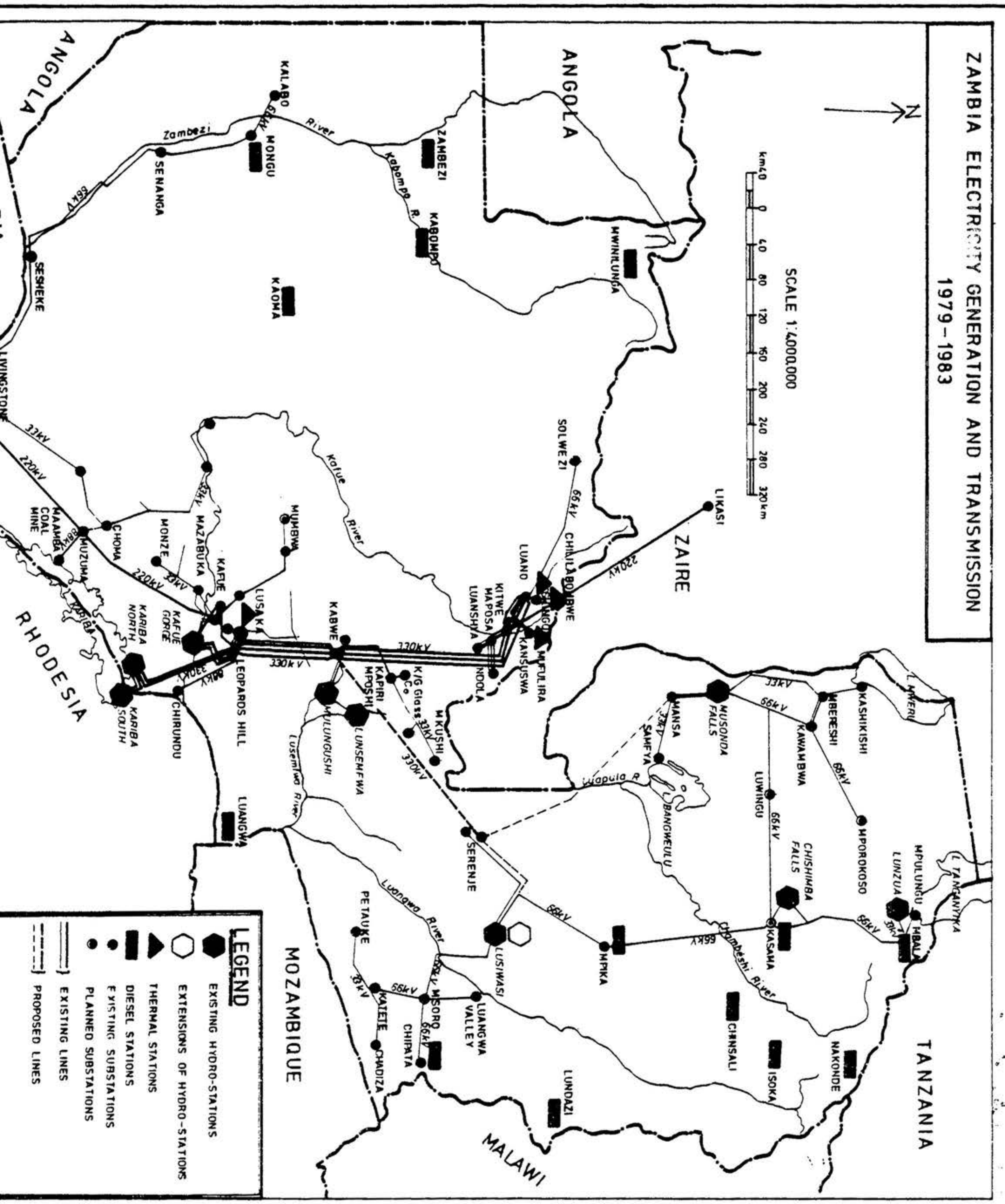
1. As far as planning is concerned, the literature surveyed does not cite a case where real mass participation was achieved (Rondinelli and Ruddle, 1977). Incidentally, the G.E.M. have established <u>rapport</u> with the Gwembe people. This close contact could have a manifold influence on development (Sartorius, 1975). Hyden (1983) also acknowledges that the relationship that evangelical missions sometimes develop with the people could be beneficial in development work.

As we have already shown, in chapter two, the Gwembe Valley has limited land resources. Nevertheless, this deficiency in land seems to be compensated by the resources that the presence of the lake has brought. The institutional framework in this area should take positive note of these two factors.

At the moment, the Gwembe District Council has no significant linkage with the Lake Kariba resources. In fact, even the electricity itself, which necessitated the lake's formation and people's resettlement, has not yet reached most of the Gwembe Valley areas! The only existing links are those which transmit the electricity from Kariba Dam to Zimbabwe and other areas of Zambia, and also to Maamba Colliery town (Figure 7:2).

In our previous discussion of the experiences with the pilot irrigation schemes, we saw that, although the hydrological plans of the schemes were based on the designs of the Lake Kariba fluctuations, the operations of the lake do not in any way consider the interests of irrigation. Likewise, in our discussion of fishing on Lake Kariba in chapter three, we saw that the Gwembe people themselves are not very much involved. It was shown that, in Gwembe South, all the twelve fishing rigs in operation in 1983 were owned by foreigners; and the fish caught was all destined for the urban market.

This clearly demonstrates the inadequacy in the present planning and administration of the Gwembe Valley resources if our task is to develop the rural areas with the resources with which they are endowed. It also shows the weakness, or the inappropriate environment, in which the Mpika model would be instituted. In this regard, it would be imperative to try to devise, at least hypothetically, an alternative



Source : Zambia [1979]

institutional framework which would take into account the socio-economic history and the existing environmental factors, both in the planning and in the realisation of the Gwembe Valley resources.

Integration of Land and Water Resources; and the Exploitation of the Hypothetical Paradigm

From the 1930's, most of the discussions and approaches on the integrated planning and development of land and water resources have tended to be influenced or inspired largely by the Tennessee Valley Authority (T.V.A.) in the United States of America (Teclaff, 1967). According to Saha and Barrow (1981), the development approach used by the T.V.A. was aimed at three inter-related but separately evolved concepts:

1. It was a multiple-purpose project.

2. The unity of the drainage basin was taken as axiomatic.

3. The acceptance of state intervention in the promotion of social welfare was firmly implied (*ibid*).

It was felt at the time that the pursuit of single projects in river drainage basins had undermined the development of other resources. Thus, it was suggested that a more comprehensive approach to river basin development would subordinate single-purpose schemes. However, to bring this about demanded a different kind of planning: planning which was more inward looking. This actually meant regarding each designated river basin as an economic unit (Teclaff, 1967). Politically, the idea was feasible, in that the intervention of the state was aimed at ensuring that interests of all concerned parties in the basin were going to be taken care of, both in project planning and in implementation. In fact, it was envisaged that the new approach was itself going to promote democracy within the valley (Lilienthal, 1966).

Even though there are doubts as to whether the T.V.A. achieved its objectives, the approach continues to be seen as a prototype of river basin development planning (Saha and Barrow, 1981). Indeed, we showed in chapter three that, when the whole idea of damming the Kariba Gorge was gaining momentum, it was already being mooted that the whole Zambezi River could be seen and developed in the same fashion as the Tennessee Valley (Debenham, 1952). Nevertheless, during the course of the discussions, the hydro-electric interest dominated and it progressively overshadowed all other interests. Thus, when the Higher Power Board (H.P.B.) was created, its prime concern was the generation of electricity. Up to this day, the H.P.B. executive agency, the Central African Power Corporation (C.A.P.C.O.) is still entirely focussed on H.E. generation.

In the last chapter, we saw that, despite the functional purpose of C.A.P.C.O's. operations, it is willing, and indeed does, provide its technological services to other interests concerned with the Zambezi River resources. As far as the Gwembe Valley is concerned, this marks a challenging episode in the pursuit of the integrated development of the land and water resources. The realisation of this objective would necessarily require an appropriate - and different - institutional framework.

Here, we need to remind ourselves that Lake Kariba also marks the border between Zambia and Zimbabwe. Moreover, the lake regulating agency, C.A.P.C.O., is owned by these two riparian states. As such, whatever is suggested concerning the use of Lake Kariba's waters (and, for that matter, the institutionalisation of the use of the Flood Warning Control System of C.A.P.C.O.) would have to be seen in light of the implications of the international legal and political framework.

The Kariba Dam Project has, from the early beginning, brought a lot of controversy between the two countries. We showed in chapter three that even though, in the final analysis, Kariba was chosen instead of the Kafue, the Northern Rhodesian government still favoured the latter. In political terms, the Kariba Project was seen as symbolising the Federation of the Rhodesias and Nyasaland (Colson, 1971). Nevertheless, the break-up of the Federation in 1963 and the disastrous Unilateral Declaration of Independence in Rhodesia in 1965 strained the political relations between the two riparian states. Consequently, the partnership in the C.A.P.C.O. was undermined (Austin 1968).

Indeed, the new Zambian government decided in 1966 to go ahead with the Kafue Gorge Hydro-Electric Scheme. Later, the Kariba North Bank plant was also installed and, in 1977, it started generating hydro-electricity. Other small units have also been installed in other areas of the country (Figure 7:2). These developments in electricity energy generation have made Zambia self-sufficient in electricity needs. In fact, Zambia now exports almost 50 per cent of its share from the Kariba complex to Zimbabwe (C.A.P.C.O. n.d.; Johnson[1]).

On the Zimbabwean side as well, developments are going on which might decrease the country's reliance on electricity supplies from

1. Sheena Johnson is currently conducting a research study on the energy needs of Zimbabwe. She is based at Science Studies Unit, Edinburgh University.

Kariba. In fact, plans are already under way to harness the H.E. resources of the Mupata and Chete Gorges, both along the Zambezi River. The former lies downstream of the Kariba Dam and the latter just upstream of Lake Kariba (Du Toit, 1984). The Zimbabwe government is also developing the Hangwe Thermal Power Station. In an on-going research on the energy needs of Zimbabwe, Sheena Johnson speculates that it may not be long before the distribution of electricity in Zimbabwe is transferred from the C.A.P.C.O. to the Zimbabwe Electricity Board. In Zambia, this function is already being undertaken by Zambia Electricity Supply Corporation (Z.E.S.C.O.) (Z.E.S.C.O., n.d.).

This discussion does suggest that the C.A.P.C.O's. existence, and in a sense its future functions, will have to revolve very much around the Kariba Dam. This being the case, the C.A.P.C.O. could be expected to widen its functions, but at the same time to be more concerned with other resources that are connected with the Dam. For example, Lingen (1973) demonstrates that the fluctuation of the lake levels, especially the drop in summer, tends to have a profound influence on the fauna and flora of the lake. However, the political precedence in the Southern African region and the rush for self-sufficiency in energy needs in Zambia and Zimbabwe successively diminish the importance of the Kariba Dam complex as a provider of electricity to these two countries. Thus, we feel inhibited in considering a jointly owned institution with far-reaching functions. In fact, it is doubted as to whether the Kariba Dam H.E. Project itself would have materialised in the post-Federation years (Williams, 1977). In this regard, the functions of the C.A.P.C.O. could only be of technical advisory in nature, in such areas as the common usage of the lake and the accumulation of hydrological data and the determination of measures necessary to preserve and improve the flora and fauna of the lake, rather as earlier suggested by the Power Commission of the Central African Council in 1951 (King, Jur., 1967), but more concerned with the lake and how it is affected, and affects, the upstream and downstream Zambezi River regime. Indeed, we showed in the last chapter that C.A.P.C.O. has established links in which it diffuses hydrological information both within the riparian territories and also downstream to Mozambique. The issue now is how the transmitted information could be used in fostering integrated development of the lake Kariba Basin itself.

Even though the Zambian Ministry of Agriculture and Water Development is pushing for the adoption of the 'integrated rural development' model promoted in Mpika, in this discussion, we feel the experiences and lessons already gathered in Gwembe South would be most appropriate in the designing of an alternative institutional framework.

In this discussion, we have shown that, even though the operations of the Gossner Evangelical Mission were under the umbrella of the G.S.D.P., the micro projects themselves did not issue from a pre-existing 'blueprint'. In fact, it was shown that, when the regional plan was drawn, it merely endorsed what was already under implementation. Thus, its supposed rationality was based, at least, on some field experience. The G.S.D.P., as an institution, merely served as a conduit through which the technical assistance was conveyed. Where appropriate, local institutions responding to a particular need have evolved from the G.S.D.P. and the technical assistance has been redirected to particular activities.

This precedence in Gwembe Valley suggests that it would be better to introduce technologies and organisational methods which could easily be performed by the people themselves in their own institutions. In fact, instead of starting with the establishment of an institution, it might well be better if institutions evolved out of the activity being performed (Biggs, 1981; Hyden, 1983). It is only when the productive potential of an activity or technology is proved that the general population will involve themselves with it (Ruttan, 1975; Rondinelli and Ruddle, 1977). What we intend to emphasise at this juncture is that, if the Mpika I.R.D.P. model is wholly adopted in Gwembe Valley, with its insistence on promoting <u>existing institutions</u>, which in most cases mean government departments and institutions, the existing pattern in which there are no coherent linkages between the lake and water resources would be reinforced and perpetuated. Moreover, the technological development of this institution might result in the widening of the technological capacity gap between the existing institutions and the general public. Chambers (1983) convincingly demonstrates that, if rural development is to be sustained, it has to pay proper attention to the improvement of the <u>existing conditions of the small farmer</u>. Underhill (1984) applies the same dosage to water manipulation discussions. If this is the case, how could a lake-regulated agriculture be promoted and sustained?

In our discussion of the management dimensions of the Buleya Malima Irrigation Scheme in chapter five, we noted the operational problems that arose from the changes in promoting departments and institutions. Thus, with our paradigm we shall suggest starting in an area where the lake fluctuations are already being appreciated and where a possible promoting agency already has a long-term experience and appreciable <u>rapport</u> with the general population. This place cannot be other than the Siatwiinda Pilot Irrigation Scheme.

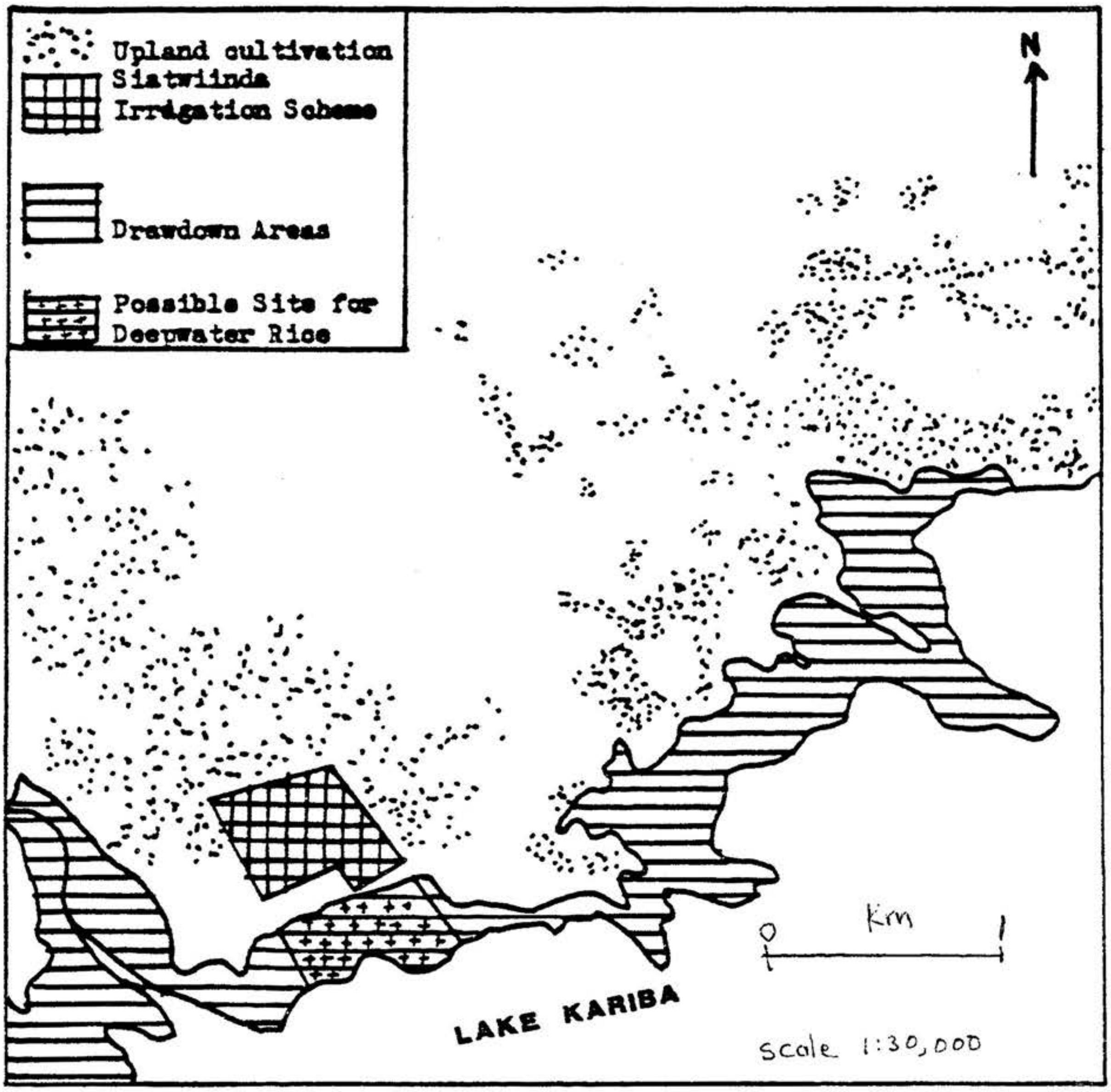
At Siatwiinda Scheme, there is an on-going agronomic research exercise. The present cropping pattern at Siatwiinda is actually an adoption of the trial results from the research component of the scheme. Since the cropping pattern at the existing scheme has been devised, the research component could start field trials of deepwater rice in the drawdown areas. We have already shown in the last chapter that there are existing deepwater rice trials at the National Irrigation Research Station at Nanga, Mazabuka. Thus, we are suggesting the extension of these trials to the farmers' <u>own</u> farming conditions.

In our discussion of the wider impacts of the extension of the Siatwiinda Scheme, we noted the resentment that has arisen from the livestock owners who use the drawdown area in the later part of the year as a grazing area. Instead of exacerbating the conflict on land use between crop production and livestock rearing, efforts and resources could be directed not along the lake shore, but towards the lake waters from the scheme (Figure 7:3). The conflict with livestock owners will be avoided in that the rice is planted as the floods come in and as the animals are simultaneously taken to the upland.

The Research Branch at Siatwiinda could establish a link with the Central African Power Corporation. Thus, they could be advised on the likely trends of the lake level. Indeed, at Siatwiinda Scheme, Lake Kariba levels have been recorded since 1970. They are only lacking the flood forecast data. In the analysis of data, they could be assisted by more senior officers based at Nanga.

Once deepwater rice cultivation has proven itself, it might be

Fig. 7: 3 A Possible Site for a Pilot Lake Kariba Regulated Deepwater Rice Cultivation Paradigm at SiaTwiinda



easier for farmers within the existing scheme, or those on the waiting list, to come to take up plots. Thence they could establish their own farmers' executive committees (F.E.C.). Other suitable areas along the lake shoreline could also be used; but there has to be a very strong link between the F.E.C's. and the Research Branch at Siatwiinda, which will have to monitor the experience as well as provide flood forecast data to the farmers. We do not assume that there is no role for government institutions, for of course they will always be there; only that the interactions encouraged by this paradigm between the local institutions, in this case the Farmers' Executive Committees and the government through the Research Branch, will in the long run overcome generations of antipathy toward the central government and presently towards the ruling Party (Hamer, 1976; Magesa, 1978; Cheema, 1983). Thus, as far as Gwembe Valley is concerned, the grass roots approach of the Gossner Mission, through the G.S.D.P., seems to be more appropriate. However, if the Mpika model is adopted, <u>the intervention on improving the technological capacity of the existing institution rather than improving the existing technological level of the farmers</u> will inevitably result not only in widening the technological gap between the two, but also in the unabated animosity continuance.

<u>Conclusion</u>

In this discussion, we have attempted to present the historical perspective of government administration development in Gwembe District. We have shown the main impacts of the government's intervention in the lives of the Gwembe Tonga. It has been demonstrated that, both in the <u>pre</u> and <u>post</u>-damming periods, the Gwembe people have yet really to see the government administration as necessarily representing or safeguarding their interests.

Incidentally, the coming of the Gossner Evangelical Mission to the Gwembe South region seems to have filled an administration gap. This is reflected not only in the diversified nature of the activities in which they have been involved, but also in the way in which the technologies or activity which they promote have subsequently been institutionalised. Thus, a precedence has been set in which interventions are more directed at the grass root institutions rather than at improving the technological capacity of existing government institutions.

We can thus conclude that the interaction that technological development demands between local institutions and the government could mitigate the animosity between the people and the state and, in the final analysis, could foster decentralisation and a greater will to self-reliance.

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CHAPTER EIGHT

Summary and Conclusions

In this thesis we have discussed a number of variables that are concerned with rural development in the Gwembe Valley. In such a study in smallholder agricultural systems the focus of attention has had to be broad.

In Chapter One, we conceptualised our study. The problem of our area of study was defined as a lack of appropriate intervention measures in resettlement programmes, which could consider the farmers' <u>own</u> agrarian technological level, and, consequently, a lack of adequate documentation. The issues were extended to the discussion of smallholder irrigation, where it was shown that, despite the recent interest in the subject, the literature still has not discussed it adequately and, as a result, the intervention measures have not necessarily been effected. They still operate as before. Thus, we set out to show how the Gwembe Valley fits this pattern, and we also set out to show how intervention measures could be aligned, both to the farmers' own agronomic technological level and also to the regulations of a man-made lake.

The geo-physical features of the Gwembe Valley were discussed in Chapter Two. The main interest was to show the precarious nature of this area's land and water resources. Lake Kariba formation has been shown to have limited arable land resources, and the existence of the Zambezi Escarpment has blocked settlements further away from the lake. Nevertheless, the pedalogical discussion has shown that the lakeshore also has areas of alluvial deposits. These soils are of exceptional agricultural potential, especially with a reasonable and normal rainfall. However, the rainfall pattern and intensity of fall in the Gwembe Valley is not favourable. The pattern or rainfall is very varied, both within seasons and between seasons, and the distribution is not even. In fact, the Gwembe area receives the least rainfall in Zambia. Nevertheless, the rain which affects the lake level, and hence flooding, falls in the north of Zambia, an area with the highest rainfall. Thus, despite the low rainfall in the Lake Kariba catchment area, the lake level is not adversely affected.

In Chapter Three an attempt was made to show the soio-economic history of the Gwembe Valley before damming (1960). The discussion was extended to the experiences in the resettlement programme. We demonstrated in this discussion that the Gwembe Tonga could once have been one of the most prosperous Central African kingdoms, before colonial rule. Extensive archaelogical evidence has been shown to support this contention. The decline of the Gwembe Tonga diaspora has been traced further back (that is, to before colonial domination in much of Central Africa). Early disturbances have been seen to be the Mfecane incursions from the south tip of Africa. Colonial incoming extended such process.

The geo-physical character of the Gwembe Valley has been shown to have discouraged early colonial settlements in the area; and it has also inhibited people from going to the plateau. Thus, the Gwembe Tonga did not initially feel the direct impact of colonial incoming. We have shown that in Zimbabwe, the white settlers preferred the Highveld and the original inhabitants were marginalised to less favoured areas in the Middleveld and Lowveld, in that order. In Zambia, most of the white settlers who were engaged in agricultural production settled on the plateau, and that was the area where the railway line was laid. The Gwembe Valley was designated a Native Reserve. However, the insatiable appetite for labour, both in the agricultural and mining enclaves, led the colonial administration to draw up policies which affected the distribution of resources in all areas. The hut and toll taxes were identified as the ones which were more severe, in that they transcended regional physical variations. Thus, the Gwembe Tonga were compelled to meet these taxes by engaging in emigratory labour processes. The consequences on the Gwembe domestic economy was the drawing of much needed manpower resources. And, when the decision to build the Kariba Dam was made in 1955, the people living on the Southern Rhodesian shoreline found themselves being dictated to by the Land Apportionment Act, which, until then, had not directly affected them. Consequently, they had to be resettled to much deprived areas, as other reasonably arable areas were already taken up.

Colonial incoming also brought the evangelical missions to the Gwembe Valley. Although the first attempt to settle in the area by the Jesuit Fathers failed, the Pilgrim Mission opened a successful mission. Their success has been attributed not so much to pure evangelical pursuits but due mainly to their provision of medical and educational facilities. This was seen to be compatible with the local religious beliefs which emphasised earthly material rewards rather than spiritual achievement. Thus, later activities which were associated with missionaries were easily accepted and appreciated. This was mostly the case with agricultural innovations.

In Chapter Four, however, we saw that the Gwembe Valley Agrarian System was in perpetual adjustment. Whilst earlier studies emphasised the importance of river gardens, later studies saw the upland fields as getting increasing attention. Nevertheless, we demonstrated that the Gwembe Tonga had not, at the time of resettlement reached a stage where periodic fallowing of fields was associated with settlement rotation. Indeed, the process was disturbed by the Kariba Dam construction.

In this discussion we also showed the sociological issues to acquisition of land and hence its use. It was demonstrated that, just as much as the land upon which agricultural practices were performed was in perpetual adjustment, so was the land tenure. Whereas the fertile river gardens were tenaciously guarded by the social custom, the fields which required periodic fallowing were not seen in the same light In fact, it was shown that the manner of acquisition of land in the river gardens ensured that the inheritance passed through the acceptable channel. The fallow fields, however, could be acquired with limited considertaion of security of tenure. Thus, the proportion of women obtaining fallow fields from their husbands was much higher than in the provision of river gardens. Here, they preferred to acquire through their lineage or through their own efforts. Hence, the security of tenure was ensured.

The position of livestock rearing in the Gwembe Valley Agrarian System was also discussed. We showed that, though the Gwembe Tonga are not a predominant pastoral society, livestock rearing is very much entrenched in their agronomic activities. In fact, the social custom was shown to favour the cattle herder as against a cultivator. We demonstrated how the cultivation activities were integrated to pastoral activities. After the harvest of the cereal crops, animals are allowed to feed widely. We have shown that, in cases where the crop fields have to be guarded, it is the onus of the cultivator to protect his crops. We can, thus, realise that grazing fields are not clearly defined nor reinforced.

In Chapter Five, an attempt was made to evaluate the smallholder irrigation schemes that have been promoted in the resettlement programme. Before the exercise was done we showed that the literature still lacks a paradigm for evaluation of smallholder irrigation schemes. The inadequacy of the existing models has been shown to lie in the ignoring of certain valuables which the cultivator considers important. We have thus borrowed a model which was used on the evaluation of the Gezira Scheme. The importance of using this model has been shown to be its insistency on trying to be all embracing. The model focuses attention not only on the production process itself but also on the impacts on the surrounding peripheral activities.

The irrigation schemes studied were not part of an overall Kariba Dam Hydroelectric. We have demonstrated that the hydroelectric plans precluded any consideration of irrigation agriculture in their operation. Nevertheless, the Northern Rhodesian government engaged a consultancy firm to appraise the possibilities of smallholder irrigation along the shores of Lake Kariba. It took almost nine years for these plans to be considered. The project which was established by the government, Buleya Malima, was beset by institutional rearrangement, whilst the Siatwiinda Scheme has had a steady promoting institution. Later, all schemes came under the umbrella of GSDP, managed under a technical agreement between the Zambian government and the Gossner Evangelical Mission of West Germany.

The experiences in the irrigation schemes reveal that when they were initiated they were labelled pilot projects. This was based on the assumption that the technology to be introduced - irrigation with the aid of engine pumping of water from the lake - was novel to the area, and that the crops to be grown in the systems had not yet been chosen. Nevertheless, when the Zambian government considered the schemes in 1969, it was observed that some farmers were already cultivating the drawdown areas of Lake Kariba. In fact, it was already noticed in 1964 in the first hydrological cycle of the lake level that the crops grown on the drawdown areas were exceptionally good.

Despite the institutional rearrangement at Buleya Malima, the pilot phase confirmed that cotton could successfully be grown under irrigation during the rainy season, November to March, and vegetables could be grown in the dry season. At Siatwiinda, rice cultivation was confirmed in the rainy season, and vegetable production in the dry season. The other scheme at Nkandabwe Dam adopted the Siatwiinda cultivation pattern.

In our assessment of the irrigation schemes, we noted that the cultivation pattern adopted in the schemes does not optimise the use of irrigation facilities. For a start, the cultivation of the major crops - cotton and rice - in the rainy season means that the irrigation facilities are mostly for supplementing the inadequate rainfall. Moreover, cotton is already widely grown in the area under rainfall conditions. And the concentration of vegetable growing, in the dry season by all three schemes, has been seen to saturate the local market; and the external market along the 'line of rail' is not reliable as it is already dominated by peri-urban farmers anyway. Thus, expansion of vegetable production in the schemes has been inhibited.

In an area which is drought-prone, the realisation that rice can successfully be grown under irrigation has been seen to be well received. The community development component of the Gwembe South Development Project is convinced that rice has slowly been accepted as one of the food crops. Indeed, statistical data on rice production and marketing at Siatwiinda exhibit very wide margins between the two. In fact, when there is low production, it seems nothing gets sold, through the official channel. The increase in the proportion of women as plotholders at Siatwiinda makes us believe that there is now more dominance of household needs, in the scheme outputs, than when it is dominated by men who tend to have more propensity for cash pursuits.

The successes with rice cultivation at Siatwiinda has persuaded the GSDP that the crop for cultivation under irrigation in the Gwembe Valley has been found. Thus, they want to spread the innovation. At Siatwiinda, the plot is being extended and, as from 1979, when the GSDP took over the management of Buleya Malima Irrigation Scheme, the cultivation pattern is being changed. Cotton is now replaced by rice; and at Nkandabwe the cultivation pattern of Siatwiinda has been adopted. However, the wholesale spread of rice has been shown to compromise out of the scheme wider interests. Livestock rearing is severely affected.

As we have already noted, livestock rearing is very much entrenched in the Gwembe Tonga socio-economic fabric. Yet the planning that preceded the implementation of the schemes, and the operations themselves, have been shown to have largely ignored livestock interests. We have demonstrated that the emphasis has rather been to keep animals out, apart from the use of oxen during ploughing. Thus, the expansion of the Siatwiinda Scheme along the lakeshoreline is resented by cattle herders. Indeed, we have shown that, during the second half of the year animals are usually permitted to feed on the drawdown areas, where there tends to be some green vegetation.

And the cultivation of both cotton and rice, at almost the same period in the year, that is the rainy season (and most of the farmers do grow cotton) has been seen to conflict on their demands on resources, both human and material. Where farmers are involved in the cultivation of both these crops, they could be compelled to divert most of their attention towards cotton which is grown on a 'package'. However, we have shown that in the hope of maximising production in all fields, farmers might distribute their resources sparingly to any single activity. Indeed, we showed that this is already taking place. In the final analysis, both crops could suffer.

In Chapter Six, we saw that whilst change agents were essentially concerned with the irrigation scheme experiments, some farmers were busy cultivating the drawdown areas on their own initiative. Actually, we revealed that the technique the farmers used approximated the one they used along the banks of the Zambezi River and its tributaries before damming and lake formation. However, the lake is still regulated without any consideration of the agricultural use of the lakeshoreline. Nevertheless, we showed that the cultivation of the drawdown areas provided foodstuffs at the most hungry period of the year - the late dry and early rainy season. This virtue was also noticed in the cultivation of the banks of the Zambezi River and its tributaries before damming. Thus, the cultivation of the drawdown areas has been seen as an adaptation of the long-evolved (but disturbed) technology on the new environment. However, unlike the river flood where they had developed a capability of forecasting the likely flood magnitude of the rivers, in the new environment the lake level is regulated by man to ensure the generation of hydroelectricity. Thus, the lake is made to rise (flood) or fall (recede) depending upon the interests of hydroelectric generation. The uncertainty to the farmer of the lake behaviour (fluctuation) makes the cultivation practice very risky, and more risky, indeed, than it need be.

The uncertainties with lake fluctuations has also been seen to be affecting the irrigation schemes which depend on the pumping of water from the lake. Although both Buleya Malima and Siatwiinda Irrigation Schemes have provisions for pumping even at the minimal operating levels of Lake Kariba, the experiences in the most recent drought (1981-84) have shown that in periods when food is scarce the schemes fail to pump water and, as such, they are abandoned. This is in spite of the fact that the irrigation plans were based on the design of the operations of Lake Kariba. We showed that the main problem was the lack of co-ordination between the cultivators and the lake regulating agency, the Central African Power Corporation.

Yet, in the discussion of the operations of Lake Kariba, we showed that though the lake is regulated much to its design, operational adjustments have been going on since the Kariba Dam was constructed. In fact, some of the changes have been demanded by other interests not necessarily associated with Kariba's hydroelectric generation. Indeed, we showed that CAPCO does provide flood forecasting data, downstream, to Kabora Bassa Dam in Mozambique. In fact, during the construction of the Kabora Bassa Dam, the Kariba Lake was regulated so as not to disrupt the construction. The flood forecasting capacity which CAPCO has acquired through the installation of telemetering stations in the Upper Zambezi allows CAPCO to predict the flooding of the Kariba 30 days in advance. This information could easily assist the farmers who cultivate the drawdown areas. Unfortunately they do not presently receive this information. I learnt in Zimbabwe that some expatriate farmers on the southern shoreline are provided with this information. Indeed, in Zambia the flood forecast data is sent mostly to institutions based in Lusaka. Yet the Department of Agriculture, which controls the agriculture extension service in Zambia is, amazingly, not on the mailing list. CAPCO assured the writer that it could provide this information to whoever wishes it. The experiences with the farmers' spontaneous cultivation of the drawdown areas, and the lessons gathered in the pilot irrigation schemes, coupled with the insight into CAPCO's regulation of the lake allowed us to construct a regulated hydro-agronomic model for the Lake Kariba shoreline. This was done with a firm belief that whatever is suggested should be based on the farmers' own existing technological level.

Apart from the constraints that the lake fluctuation imposes on the agricultural use of the drawdown areas, an attempt was also made to integrate the existing agronomic practices on the upland with the design fluctuations of the lake. We demonstrated that although the lake recession offered dry season grazing fields for livestock, a too rapid and early flood would require a fast shift of animals to the upperlands which, at that time, are under rainfed crops. Thus, the conflict for land between crop production and livestock is intensified. Thus, in our paradigm we also set out to attempt to resolve this type of conflict.

Since the existing agronomic practices in the Gwembe Valley do not easily integrate with the design of the lake fluctuations, we borrowed the experiences of other areas. Nevertheless, our selection was based on the experiences of Gwembe itself. Since the research component had confirmed the adaptability of rice in Gwembe Valley conditions we tried to see how it could be incorporated. We showed that the rice variety presently grown in the schemes is paddy. It is planted in shallow basins. Thus, it requires reclamation of land from the lake. Indeed, it was shown that the Siatwiinda Scheme has already reclaimed land in this way. Hence, it does not necessarily fit our requirements. From there, we considered floating or deepwater rice.

Deepwater rice was shown to be extensively grown in some of the West African riverine communities; and it was also a common agricultural practice in the monsoon climate areas of Asia. Thus, we hypothetically attempted to integrate the cultivation of deepwater rice to the design of the fluctuations of Lake Kariba. We adopted the cultivation pattern in use in West Africa and Asia. The rice seedlings are planted immediately after the first rains but before the coming flood. As the seedlings get inundated the plant elongates. It was demonstrated that some plants could elongate and withstand a depth of over 6 metres. Moreover, the harvesting is done as the lake recedes. In some areas harvesting from boats is not uncommon. Indeed, it was shown that a floating rice harvester has already been designed and used in Monsoon Asia.

The difference between this paradigm and the existing agricultural practice in Gwembe Valley is that it integrates the people's use of the floodplains and the scientific discoveries of the agronomic research component of the Siatwiinda Irrigation Scheme. Moreover, it conforms to the primary operations of the lake. As far as cropping pattern is concerned, instead of cultivating as the lake recedes, our paradigm suggests cultivating as the land gets inundated. Thus, there is a likely conflict with rainfed crops on the upland. Nevertheless, the planting of the deepwater rice seedlings could be done soon after planting the rainfed crops. Since the rice plant will be inundated there are no other labour demands until harvest time. The paradigm also extends the harvesting period and consequently food availability. Whilst most of the rainfed crops are harvested in the second quarter of the year (April-June), deepwater rice is harvested in the third quarter (July-September), as this is the time that the lake design allows the lake level to fall. However, the rice husks were seen not to be advisable livestock feed. As such, our paradigm allows the cultivation of an early maturing (90 days) local maize variety kaile or just allowing the grass, that animals already graze on, grow widely. Thus, once the maize is harvested, animals can graze on the stubble otherwise the paradigm emphasises deepwater rice cultivation. In the process, as the lake recedes, animals are given a chance to graze widely.

After the description of the paradigm an attempt was made to see how it could have worked since the lake started fluctuating. Indeed, it was clearly demonstrated that in each hydrological cycle the paradigm could easily have worked. Most of the drawbacks could have been due to the lack of co-ordinating between lake regulating agency, CAPCO, and the cultivators. Thus, the paradigm requires an appropriate institution framework which would ensure the timely remit of flood forecasting data from CAPCO to the farmers, as the paradigm depends highly on the cultivators' confidence in the data supplied and hence the likely trend of the lake level.

The institutional issues of Gwembe Valley development were discussed in Chapter Seven. The discussion was set in a historical context, at least from the time that the colonial administration exerted its influence in the area. We showed that the early colonial administration was not much concerned with Gwembe Valley development. The main aim of the colonial administration was to enforce hut and toll taxes so that the labour supply, to the industrial and agricultural enclaves, was assured. This was unlike the evangelical missions who, alongside their medical and educational projects, took an interest in local agriculture facilities. Thus, from the beginning the Gwembe Tonga have been shown to have had a close relationship with evangelical missions.

The people's animosity to the colonial administration was exacerbated when the Granary and Cassava orders were devised in the 1940's. These orders, though based on good intentions regarding drought relief food supplies, were punitively enforced. The force was relaxed when it became clear that the Kariba Dam was going to be constructed. Hence, the emphasis was now placed on finding suitable places to resettle the Gwembe people, not upon feeding them adequately and locally.

Despite the fact that the Northern Rhodesian administration opposed the Kariba Dam Scheme (whilst supporting the Kafue Gorge proposals), it assumed the responsibility of resettling the Gwembe people in its borders. The people, naturally, associated the administration with the powers behind the dam. Thus, their animosity to resettlement was directed to the administration responsible for their resettlement.

The break-up of the Federation of the Rhodesias and Nyasaland, and the subsequent attainment of independence in Zambia in 1964, has been shown not to have deflected the animosity that the Gwembe people had towards the civil administration. This was mainly because the party, the African National Congress (ANC), which had been demonstrated to have fought fiercely against the Kariba Dam construction, lost the elections to power and the party, United National Independence Party (UNIP), which had low support in the valley won, to form the first majority government. Later the ruling party declared a One Party State and ANC and other parties subsequently ceased to exist. And when the Zimbabwean wars of liberation escalated from the early 70's, the Zambian government allowed Zimbabwean freedom fighters to set up guerrilla bases in the Gwembe Valley. Consequently, the bases were a target for the Rhodesian Army. The Gwembe people were equally affected. Paradoxically, during the fighting period the Zambian government has been shown to have withdrawn most of its services from the valley. Incidentally, it was at that time the Zambian government requested the Gossner Evangelical Mission (GEM) of Berlin, West Germany, to come and work in the resettlement programme. Despite the warring situation the Gossner Mission accepted the offer. But it was demonstrated that when the first GEM team came to Gwembe they found, to their dismay, that the Zambian government had not made any preparations for their coming. Thus, the GEM team members set up their initial base at Chief Mwemba's villagewhere there was aleady an established mission station, rather than at Sinazongwe where the sub-district administration centre is located. The dearth of any prepared plan documents forced the GEM team members to start from micro-projects which were based on the Gossner Mission experiences in India and Nepal. And when the plan was drawn, it merely endorsed what the GEM members had already initiated and some of its recommendations were affected by the Zimbabwean wars, as well as the worsening of the Zambian government's balance of payments which affected the government's commitments to recurent and capital expenditures. It was shown that the funding of the projects in Gwembe valley could have been equally affected.

Although there was inadequate funding the Gossner Mission have been shown to have continued with their micro-projects, without any overall development plan. Nevertheless, to sustain the projects they initiated they resorted to the establishment of local non-government institutions evolving around a particular activity. We clearly demonstrated that these grass-root institutions seem to reflect the wishes of the people involved and operate at their level of managerial and technical level. Indeed, it was shown that it is only when external influence is exerted that the operations of these local institutions tend to be affected. This was clearly illustrated with the regional development model that the Zambian government is enforcing in many areas, now including Gwembe.

It is now generally acknowledged in Zambia that the regional development model promoted by the British Overseas Development Administration in some parts of Central and Northern Provinces of Zambia is the prototype for rural development. Indeed, we have shown that other projects supported by other international donors, especially those under the Swedish International Development Agency, are actually devising their operations within the ODA model (commonly referred to in Zambia as the Mpika model). In fact, from 1983, the Gwembe South Development has been given Integrated Rural Development Programme status (and label) so as to precipitate its adoption of the Mpika model.

We showed that the Mpika model is essentially geared to the strengthening of the existing institution, which in most cases means government departments or quasi-governmental bodies. The model has been shown as a reaction to other IRD Programmes which set out to create their own institutions, which, in the final analysis, tend to operate parallel to the existing institutions. Thus, the Mpika model opts to work within the existing institutions and in a process to improve their implementation capacities. Although we also appreciated the orientation of the Mpika model, we argued that its total imposition upon Gwembe Valley conditions will not essentially improve the living conditions of most of the Gwembe Valley inhabitants.

We demonstrated how the Gwembe District administration is presently organised. In spite of the recent reorganisation of the district structures, the District Council does not seem to appreciate the nature of the valley's land and water resources. The resources associated with the lake formation do not seem to be well recognised. Indeed, the discussion showed that even the electricity itself which resulted in the people's resettlement has not yet reached most parts of the valley, while the fishing in Lake Kariba is mostly controlled by big commercial fishermen and the fish iteself is mostly destined for the urban market on the plateau. Thus, without any change in the existing orientation of the administration of the district, the imposition of the Mpika has been feared to reinforce the existing pattern.

In this regard we have argued that the experiences and, as such, the operation criterion of the Gwembe South Development Project (GSDP), seem to provide an appropriate institutional framework for the exploitation of the Gwembe Valley resources. Indeed, we showed that the way in which the GSDP promotes the building of local institutions emanating from particular activities performed, does improve the institutional and technological capacities of the people involved. Thus, the approach is more responsive to local needs than the one which strengthens the implementation capacities of the existing government institution.

Nevertheless, we cannot ignore the role of government institutions. We showed that in the activities promoted by GSDP, existing government institutions are very much incorporated. However, the decisions on the planning and administration of activities are performed by people involved in particular activities. The role of government institutions is merely to provide technical advice. Indeed, it was clearly demonstrated that in the exploitation of the lake regulated agro-hydrological model, government instituionts will have to transmit and analyse hydrological data. The research component of the Siatwiinda Scheme was identified as an institution which could distribute hydrological data and related practice to the farmers. We emphasised that the model encourages the interaction of local institutions, hence the general public, with the government institutions, at the production level. In the final analysis it was concluded that the model builds a self-reliant spirit amongst the people, in the various activities in which they involve themselves, and also it does mitigate the animosity between the people and the central government.

Before we conclude the discussion we need to draw some implications that this study poses on smallholder agricultural systems. The discussion on the socio-economic background and the indigenous Gwembe Tonga agrarian system has clearly demonstrated that, just as much as the indigenous technology was not static, the socio-economic system was also adjusting to the change in technological systems. The study emphasises the importance of considering the socio-cultural values in the discussions of technical change in the smallholder farming sector.

The discussion on smallholder irrigation in Chapter Five pinpoints some issues which could be important in future discussions and interventions of this kind. In fact, one issue that we need to spell out clearly is that, in the smallholder sector, irrigation should not only be seen as the distribution of water for crop production but as a component in the whole eco-system in which the farmer is involved, managing for the good of all.

Indeed, it has to be recognised that in most societies, especially those based in riverine environs, water exploitation is a long-evolved activity. As such, water manipulation intervention, and discussions, in such areas should not necessarily be seen as new innovations. They should rather be based upon and be geared to the improvement of the existing technological systems of the farmer.

Unfortunately, most of the analyses of smallholder agrarian interventions are based on Western variables, which do not necessarily consider the conditions of developing countries. We met this paradox when attempting to evaluate the pilot irrigation schemes in Chapter Five. Indeed, it is now increasingly accepted that interventions and discussions on smallholder agriculture should emanate from the existing knowledge systems of the farmer (Warren and Meehan, 1980; Chambers, 1983). However, most donor agencies and, for that matter, even responsible governments, in most developing countries, do not seem to exhibit enough patience in long gestation of projects (Binns and Funnel, 1983). Consequently, they resort to devising plans based on inadequate data and information, which they then generalise through widespread imposition of blueprint models (Hyden, 1983). Thus, the varietal nature of particular areas and situations tends to be 'assumed away' (Hirschmann, 1967). This thesis has tried to argue for things to be done differently.

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APPENDIX 1

THE GWEMBE SOUTH DEVELOPMENT PROJECT : AN EVALUATION

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October 1983

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But it is the experiences of the Gwembe Valley community which really matter most.

Moses Banda

CONTENTS

Page

Part A : BACKGROUND

Part B : PROJECT COMPONENTS

PART A : BACKGROUND

1. INTRODUCTION AND OVERVIEW

The Gwembe South Development Project (GSDP) has been evaluated twice. Buntzel (1980) carried out a study on behalf of the Evangelical Mission of Germany, as a precondition of its assistance to GSDP. The Scudders/Colson team [1982], also drawing from their long-term involvement in the socio-economic studies of the region, stretching for over twenty-five years, carried out an informal evaluation on request of the GSDP staff members.

The present evaluation has been requested by the Planning Division of the Ministry of Agriculture and Water Development (MAWD), with the agreement of the Gossiner Mission representative in Zambia. Its main purpose is to review literature and data on the on-going activities of the project. The main concern is both technical and socio-economic feasibility.

The Buntzel report made very conclusive recommendations on project management, which have not yet been implemented. Apart from the appointment of a Planner/IRDP coordinator, all other activities are continuing as reported by Buntzel.

The Scudders/Colson team made recommendations which pointed to the need for building and strengthening the GSDP. Though I share their observations, I do not support their views on project development. Whereas they recommend that existing institutions should provide support to GSDP, I feel that the latter should assist the former, in their various fields.

Though I will also use my observations to throw some light on the areas seen by Buntzel and the Scudders/Colson team, my main orientation will be more active. Thus my attention will be focussed on the activities and project components which are associated with GSDP. Possible recommendations will come after each item.

In assessing each project component, a great deal of emphasis has been placed on its impact, in terms of the number of people involved and the involvement of women. Where possible, the rural income generation effect has also been assessed.

Part A of the report is on project planning and management. A history of the project from the time of the Kariba Dam construction and resettlement, to the time of GSDP involvement in Gwembe Valley, is also presented. And Part B is a description and an assessment of the project components.

2. HISTORY OF THE PROJECT

The Gwembe South Development Project (GSDP) was established in 1970 as a regional development/resettlement project on a bilateral agreement between the Zambian government and the Gossiner Mission of Berlin, West Germany. The latter was to provide technical assistance personnel, and the former was to provide development funding.

The Gossiner Mission engages in development work (also in other Third World countries, like India and Nepal) as part of its Christian witness. This is in line with the Mission's understanding of development which, it believes, should cover all aspects of socio-economic and spiritual human endeavours. Thus the Gossiner Mission coperates not only with government personnel, traditional rulers, and target groups, but also with the local religious groups.

Unlike other regional development projects in Zambia, which were established to foster rural development and to boost agricultural productivity, GSDP should be seen as a special case, in that it was established to introduce new agricultural techniques which would assist the Lake Kariba relocatees to adapt to the new environment.

The Gwembe Valley communities had for long lived along the shores of the Zambezi river. Their agricultural activities were largely based on the cultivable soils of the region comprising the narrow alluvial strip along the Zambezi, the riverside deposits of the tributaries and the alluvial fans at their outlets. The annual rise and fall of the water levels in the rivers offered opportunities which enabled the people to practice double cropping each year. Dryland farming on the upperlands, on the mopani woodlands, was practised to a very limited extent. Thayer Scudder and Elizabeth Colson have carried out very extensive studies on the ecology and social organisation of the Gwembe people. They reveal that despite the environmental problems (a hot dry climate, short and uncertain rainfall, long history of recurrent droughts, infrequent but sporadic flooding) the agricultural practices fitted well with the local conditions.

It was the construction of the Kariba Dam, for the sole purpose of electricity generation, that was to disrupt and change peoples' life styles and environment. The lake (Kariba) which formed behind the dam entailed shifting and resettling the people on new environs, on the upperlands. The resettlement programme which began in 1958 cannot be said to have been fully completed as the people affected are still experimenting, with both old and newly-introduced technologies, on the new environment. Forced resettlement brings many hardships and stress, and the Kariba experience is no exception.

To compensate the relocatees, the Federal Government of Rhodesia and Nyasaland had planned some fishing and agricultural projects where the relocatees could get involved. The agricultural activities were mainly based on irrigation earmarked for some areas along the shores of the lake and the main tributaries.

The execution of the irrigation schemes along the shores of the lake, which were to make use of the water resources of the lake, took a long time to initiate. It was ten years after the opening of the gates at Kariba Dam in 1960 that the Buleya Malima Pilot Irrigation Scheme was established. Two years later, in 1972, the Siatwiinda Pilot Irrigation Scheme was established with the Gossiner Mission Involvement. And it was only in 1980 that a FAO irrigation research team started looking at the possibilities of harnessing the lake drawdown area resource at the Chiabi peninsula.

Of the irrigation schemes on the main tributaries, only Nkandabwe Irrigation Scheme is still in use. Most of the others had their dams silted up. Information on their actual number and locations is too scanty.

Apart from irrigation activities (excluding Chiabi), GSDP has also been involved in such diversified fields as village water supply, home economies, dryland farming, village crafts programmes, intermediate technology and (unlike other rural development projects) in the building of local, community-based, grassroot institutions.

In our evaluation of GSDP we have to bear in mind that the period of escalation of the Zimbabwean wars of liberation, from mid-seventies to early eighties, was not easy. Development efforts were severely constrained by the security situation.

The general economic position of Zambia was also in crisis in the latter part of the seventies. This came to have an effect on the government's commitments, in the provision of development funding in projects like GSDP. It is from this background that we are considering the impact of GSDP in the Gwembe Valley south region.

3. PROJECT DESIGN

Geographical Description : The GSDP activities cover the whole Gwembe south region. The area stretches from Batoka Gorge to Chipepo. To the north, on a diagonal position and parallel to the lake, the foot of the Zambezi escarpment marks the edge of the valley. The total area of the Gwembe valley region is 12,610 square kilometers.

The total population of the whole Gwembe valley is 76,451(1), and Gwembe south has 36,293 people. The concentration of population is mainly along the shores of the lake and the rivers, and on some flat areas. The general population density in Gwembe Valley is 6.1 per square kilometer.

Project Planning : The Gossiner Mission involvement in Gwembe Valley development started in 1970. Through its office in Berlin, it requested the German Development Institute (GDI) to draw up a comprehensive plan of "integrated intensive rural development in the Gwembe Valley". In 1971 the Zambian government accepted the offer of GDI for this undertaking.

The GDI (or 'Brandt') report proposed twenty-three (23) programmes for implementation in the first five years of the agreement period. The programme components were mainly in irrigation, fishing, public health community development and small cottage industries.

In the GDI team's assessment of the major problems of the area, the lack of cash income generating activities (outside the coal mining sector) was identified as of crucial importance. Thus, in order to increase the income of the people, the GDI report recommended three types of programmes which were categorized into :-

i) Regional exports - in the agricultural sector, the usual marketing of agricultural produce and the sale of cattle out of the region.

ii) Import substitution - here all sectors of the regional economy were analysed so as to ascertain the possibilities of boosting locally available goods and services.

iii) Complementary programmes - these were mainly in public health and educational services. They were seen as prerequisites for the success of other programmes.

A threefold development strategy, a combination of all the three above, was drawn up and recommended for the area.

In the agricultural sector, four out of the five projects proposed had a bias towards irrigation. The GDI team felt that the promotion of dryland farming activities could wait until enough information was gathered; therefore, it could be considered only as an experimental stage. It was the team's conviction that in the long term irrigated fruit growing, especially citrus and oranges, would be the most rewarding agricultural activity in the region, in view of the local climate and the national market.

In the fisheries promotion programme, the GDI team identified the nature of the transport network and the marketing system as the major constraints. But since these were seen more as matters of national concern, they recommended the establishment of an integrated lake and road transport system, and also the involvement of the local communities in the marketing of fish.

In the import substitution programme, the potential for using local loam and coal from the Maamba Coal Mine for making bricks to be used in construction works (both in villages and in the construction of government and other institutional buildings) was identified. The trade, service and recreational sectors were also seen as areas of considerable potential in the utilization of these materials.

4. PROJECT IMPLEMENTATION

Though it can be acknowledged that the GDI team provided a valuable strategy for Gwembe south development, it must be realised that the total implementation of their recommendations could not be executed for three major reasons :-

i) The GDI team was not requested to draw up programmes which were going to be implemented, but rather to provide specific recommendations which could be considered by the Zambian government. It was up to the latter to accept, reject or to implement the proposals partially. To my knowledge, the Zambian government did not commit itself to provide development funding for the total implementation of the GDI's recommendations.

ii) The geographical position of the area vis-a-vis Zimbabwe, and the Zambian government's commitment to the total liberation of the southern African region (which came to be manifested in its support and provision of bases to the liberation movements), made the Gwembe Valley region into a frontline, and to some extent battlefield, when the wars of Zimbabwean liberation escalated from 1973 onwards.

iii) The experience of the first three years of the project had shown that the Zambian government's contribution, even to the projects to which it had committed itself, was not being maintained. The capital allocation decreased from K79,742 in 1972, K65,000 in 1973, K63,250 in 1974 to K58,000 in 1975.(2)

Thus, in 1976, the agreement between the Zambian government and the Gossiner Mission had to be renewed, because it was already clear that the planned projects could not be completed under the 1972 agreement.

The new agreement rejuvenated the project, both in terms of activity and capital financing. The rural works programme was initiated and the dryland farming programme was reactivated. Table 1 shows the government's capital allocation from 1972 to 1982. The percentage changes from year to year are also shown.

Towards the end of the seventies and early eighties it had, again, become evident that the Zambian government contribution, in terms of capital financing, was dwindling. This was also the time when the hostilities between Zambia and her southern neighbour on the other side of the lake, ceased. Thus it was now possible to execute and implement the projects that were constrained by the security situation.

Looking at the critical economic position of Zambia in 1979, the Gossiner Mission, with the agreement of the Zambian government, requested the Running Costs Advisory Committee (FKA) of the Evangelical Mission Board of Germany (EMM) for financial support to GSDP. FKA committed a total sum of K46,800, which was 45.04% of the capital budget of that year (1979).(3) But, as a precondition for future financial support, FKA asked for an evaluation of the project. In April 1980 Dr. Rudolf Buntzel was engaged to carry out this exercise.

5. THE BUNTZEL EVALUATION

The Buntzel report was very critical of the project's emphasis on irrigation, of its management structure, and on the way project components were being planned and implemented. It very much doubted the beneficial impact of the project on the majority of the Gwembe Valley population -- the subsistence cultivator and fisherman, who was supposed to be the target of the project.

Buntzel felt that, although the first (1972) agreement between the Zambian government and the Gossiner Mission had a bias on irrigation (which came to be reinforced in the Second National Development Plan, 1979-83, p.194, which mentioned only irrigation, and the workshop and research activities of the project, in its budget of K300,000), a shift in emphasis from irrigation to dryland activities was necessary. In spite of the environmental conditions which favour irrigation, the high investments needed, the degradation of the soils by saltification because of poor drainage in the existing schemes, and (most importantly) the involvement of only an insignificant segment of the population in them, call for caution in their promotion. (On the present assessment of the impact of irrigation schemes in the Gwembe Valley, refer to the section on irrigation in part B of this report.)

6. GSDP/IRDP INTEGRATION OR LOCALIZATION

The Buntzel report could not have come at a more opportune time, in that it was produced just as the Planning Division of the Ministry of Agriculture and Water Development was looking for mechanisms of integrating the activities of Integrated Rural Development Programmes, in other provinces, into the relevant local institutions. Unlike the Scudder/Colson report (1982), which proposed ways of strengthening GSDP as an institution, Buntzel (in line with the Planning Division's new directives on the running of IRDPs, and in conformity with the Zambian government's decentralization policy) proposed the diffusion of GSDP resources, in terms of capital financing and technical personnel, into relevant local institutions.

The planning of project components was also to be within the relevant institutions, with the Gwembe South Development Committee (GSDC) as a policy making body. It was his conviction that, if the existing structures were used, the planned projects would to some extent be a reflection of the felt needs of the Gwembe community.

From my assessment of the present GSDP situation, it seems quite clear that, in spite of Buntzel's recommendations and the provision of the Zambian government and Gossiner Mission Agreement that the project should just be an executing agency, with GSDC drawing up the plans, the project officers draw personal professional plans which are submitted for endorsement in the staff meetings. Thus, as Buntzel observed, the staff meetings are still the policy making gatherings of GDSP activities.

Drawing from GDSP experiences, in comparison with those of the Swedish (SIDA)-supported and British-aided IRD programmes in other parts of the country, it becomes increasingly obvious that the British/IRDP model seems the most appropriate. In this model, the emphasis is on improving and strengthening the implementation capacities of the relevant departments and institutions, at the local level. In the GSDP and SIDA-supported IRD programmes, in contrast, the experience has been one of projects which have, themselves, developed implementation institutions in parallel (if not in competition, in terms of clientele) with the relevant departments and institutions.

For programme-supported projects, this arrangement has been quite successful in project component completion, but it has generally failed to answer the long-term project implications. Where the projects had done all the work, roads have been constructed, dip tanks built, marketing sheds constructed, new income-generated activities initiated, new agricultural camps opened, and so on -- <u>but</u> the relevant department or institution has, in most instances, failed to run, and at times has refused to take over these facilities.

These problems have, usually, arisen because project initiators, when identifying projects, have only identified the need for a particular project component without seeing or assessing the recurrent cost implication of these components on the relevant department or institutions. Thus, since these projects have not arisen from these institutions, they have, once taken over, become a drain on the institutions' meagre resources. It has to be realised that the recurrent budgets of most government departments are at best static; many are even decreasing in real terms. The overstretching of these departments' limited resources, by forcing them to take over some of the facilities and services initiated by technical assistance projects, usually results in severe consequences on their implementation capacities.

It is from this background that it is suggested, in line with the Zambian government decentralization policy, that all GSDP technical/professional officers should as soon as feasible be diffused into the relevant sections of the district council, government department or local institution.

Any new project component or technical assistance to be considered should first be assessed in terms of the long-term capacity of the relevant institution to take over running such facilities and services. If this capacity is lacking, then the question should be how it could be improved. If it is a question of personnel, and if the GSDP can provide resources, such staff should, from the outset, be assigned to these institutions.

The placement of GSDP officers in Gwembe South Builders' Cooperative and in the Gwembe Valley Self Help Promotion Society should be seen as steps in the right direction. This should go further, even in agricultural activities, with the placement of an officer with a bias on dryland farming activities in the Training Section of the Department of Agriculture, to be based at Kalima Farmers Training Centre; a Female Extension Officer to be placed in the Home Economics Section; a Water Engineer to be placed in the relevant section of the District Council; a Fisheries Promoter to be stationed at the Fisheries Training Centre; and so on. With this support, the implementation capacities of these institutions will be improved, and any project implemented will have to evolve from these institutions. Thus a precedent will have been set, in which the long-term project continuation is carried out on a recurrent budget.

The direction being taken by the recently appointed (May 1983) Gwembe Valley IRDP Coordinator, in letting project proposals come from the local institutions for discussion in the IRDP Steering Committee (whose membership is drawn from officers and representatives of local institutions), should be seen as a step in the right direction. As a feedback, IRDP resources should move along the same route.

PART B : PROJECT COMPONENTS

As already mentioned in Part A, GSDP activities are mostly geared toward the introduction and promotion of an irrigation system of agriculture. Most of the attention and resources have, therefore, been put into irrigation schemes.

1. Irrigation

GSDP activities on irrigation have centred on Siatwiinda Pilot Irrigation Scheme, Buleya Malima Pilot Irrigation and Nkandabwe Irrigation Scheme. It has also, at one time or another, been involved in trials of small scale, hand-pump irrigation systems, and of late, even in drawdown (silili garden) irrigation. We now assess the impact of GSDP in irrigation farming in Gwembe South region.

1.1 Siatwiinda Irrigation Scheme

a) History : The Siatwiinda Pilot Irrigation Scheme (SPIS) was established in 1970. But the work on technical lay-out was not completed until early 1972. The first farmers in the scheme were enlisted in the 1972/73 season (see Table 3).

b) Location : The SPIS is situated in Chief Mwemba's area at Siatwiinda village on the south-western bank of Lake Kariba.

c) Objective : As a compensation to the Lake Kariba relocatees, SPIS was established as a means of increasing agricultural productivity and thereby boosting their standard of living. It was a pilot scheme inasmuch that knowledge was needed to ascertain the best crops that could be grown in the area under irrigation, and also to assess the farmers' response to the new way of life which irrigation farming entails.

d) Hectarage and Field Lay-Out : The total area of the scheme is 32 hectares of which 4 hectares is under the research branch, and 10 of which has just been reclaimed from seasonal inundation. Thus the hectarage under the scheme is 28ha. But we have to consider that this also includes the drainages, canals, paths etc. The actual hectarage under cultivation by the farmers is therefore only 22ha. The plots are 0.2ha each. The whole scheme has 110 plots. There is a provision of extending the scheme to a further 80 to 100 hectares.

e) Implementation

e.1 Management : SPIS is run by the Farmers Executive Committee (FEC) which decides on the allocation and disallocation of farm plots to the participants. On the technical side the Department of Agriculture has seconded an Agricultural Assistant, and GSDP has, from its inception in 1972, placed an officer as an Agricultural Adviser to the scheme.

e.2 Finance : The Government of Zambia has been the major supplier of development funding to the scheme. The physical structure and establishment of the scheme costed K120,000 (Buntzel, p.29). Over the period 1972-80, the government has invested more than K55,840. This excludes the government personnel costs assigned to the scheme. Some financial assistance has also been received from other donors, through the Gossiner Mission (GM).

Table 2 shows the financial flow to SPIS from 1972 to 1980. Excluding the GM technical personnel and the Zambian Government's civil servants' costs, the total investment in SPIS in this period comes to K188,965.

e.3 Farmer Involvement : Table 3 shows the yearly total number of farmer participation in SPIS in the ten-year period 1972-82. It has only been possible to identify the involvement of women as plot holders/owners in the last five years (1978-82). It is interesting to note that the number of farmers involved in the scheme has more than doubled in the ten year period. The static position in the first three years, 1973 to 1975, should be seen as a period of uncertainty. For those involved (promoters and farmers) it was a time of experimentation; for outsiders it was a period of having a close watch. The steady increase from 1976 onwards could be as a result of the farmers acceptance of irrigation technology.

A period of experimentation and uncertainty can also be observed in women's involvement in the scheme. But Table 4, which is deduced from the data on Table 3, shows a very interesting picture on the sex proportional changes in the period 1975 to 1982. Whereas the proportion of male participation has been decreasing, that of women has been increasing. This should lead us critically to examine the way in which new technology is diffused and adopted between the sexes. The Siatwiinda experience shows us that irrigated technology was initially focused on men and then expected to be passed on to women. But the sex proportional changes in farmer participation show that women are not necessarily slower adopters of technology, but that they do adopt innovations cautiously : this could give the technology a much longer lasting effect.

e.4 Crop Production : The primary purpose of the crop production aspect of SPIS was, initially, to determine the most appropriate crops which could be grown under Gwembe Valley conditions. It was also intended to ensure the generation of incomes to those involved; to boost the food supply situation to the area; and thus to improve the living standards of the people.

From the crop research trials that were conducted in the first four years (1972-75) on various crops (onions, beans, groundnuts, rice, soyabeans, cotton, sunflower, wheat, sorghum and high yielding maize variety [SR52]), rice proved to be the most promising crop, technically, as it was observed that in the rainy season

(November to March) farmers preferred to grow sorghum, bullrush millet and the local maize, kaile. Farmers turned to the production of vegetables (onions, tomatoes, cabbages, etc.) only in the dry cool season (April to September). This is the only time that the facilities provided by irrigation technology are utilized.

e.4.1 Rice: Table 5 shows the production and marketing trends of rice from 1976/77 to 1982/83 seasons. This table shows that the production of rice rose quite dramatically and more than doubled in the first two years. But from the 1979/80 season the production started declining.

From my discussions with the people who are (or have been at one time or another) involved in the scheme, it seems quite clear that the decline in production can be explained by four main reasons :-

i) the training of farmers in the scheme, after enlisting, is ignored;
ii) the experience of farmers, over the years, was that they could not ensure a steady flow of water in the plots, because of frequent engine mechanical problems;
iii) the drought situation of the past two years has put a big strain on the capacity of the scheme's resources in terms of manpower and machinery; and
iv) the poor drainage system has led to soil saltification.

The difference between yields and marketed bags of rice can be explained by two main reasons :-

a) the community involved is accepting rice as a food crop
b) since the marketing of rice is not strictly controlled, part of the produce is sold by the individual farmers, without informing either the scheme advisers or the Farmers Executive Committee.

An assessment of the consumption patterns in the area (p.15) confirms the first explanation.

The system of rice marketing that has evolved in Siatwiinda has acted as a great incentive to rice production. Five marketing channels can be identified :-

1. National Agriculture Marketing Board (NAMBOARD);
2. Southern Province Cooperative Marketing Union (SPCMU);
3. Valley Self-Help Promotion Society (VSP);
4. Siatwiinda Savings and Credit Union; and
5. Individual farmers.

Before 1980, NAMBOARD was the official supplier of requisites and farm implements, and also the purchaser of produce from farmers in those areas where primary societies had not yet been formed, and thus the cooperative (SPCMU) was not operating. Table 6 shows the number of bags (in 80 kilogram bags) purchased by NAMBOARD from the area from the 1975/76 to the 1979/80 marketing seasons.

The differences in figures between those on Table 5 (on rice sales from SPIS) and those on Table 6 (on NAMBOARD rice purchases) indicate that there were other farmers or schemes - the Nkandabwe Irrigation Scheme, for instance (p.22) - which were also selling rice to NAMBOARD. But in the 1977/78 marketing season the Tables show that SPIS sold more rice bags (150) than were purchased (88) by NAMBOARD. This confirms the existence of other marketing outlets. Between 1978/79 and 1979/80 marketing seasons, SPIS had become the only supplier of rice to NAMBOARD, and the latter had also become the only official purchaser of rice.

With the withdrawal of NAMBOARD from purchasing of produce, as from 1980, SPCMU took over this function. But the production of rice began to decline; SPCMU has thus not yet handled any rice from Siatwiinda.

The Valley Self-Help Promotion Society (VSP), a local institution established with GSDP assistance, has also been involved in the purchasing and marketing of produce from SPIS. In 1979, the society imported a rice huller/polisher from the United Kingdom. This enabled it to purchase rice from the farmers, process it, and then sell it to the local community. This factor can account for the very low sales of rice to SPCMU from 1980 onwards. However, VSP does not keep proper records which could enable a quantitative assessment of its involvement in rice purchasing, processing and marketing at Siatwiinda.

Siatwiinda Savings and Credit Union has also been involved in the marketing of produce on behalf of the farmers. It was earlier seen by the project officers (GSDP, 1978 Annual Report p.3) and it was acknowledged by Buntzel (1980 p.9), that the Credit Union was the most capable institution in the marketing of produce, as it acted as a link between the farmers and NAMBOARD (and later SPCMU). But it is now being emphasized by the GSDP Credit Unions Promoter that credit unions are not supposed to be involved in any income generating activities. Thus the credit union has now withdrawn from handling produce.

In addition, individual farmers usually make their own marketing arrangements, especially when the quantity of produce to be sold is limited. With the installation of the rice processing machine, farmers can have their rice polished, and then they can sell it straight to the consumer.

ASSESSMENT : As pointed out elsewhere (p.12), rice has proved to be the most feasible crop for Siatwiinda conditions. The farmers have mastered the techniques of its production, and it has been adopted in the local consumption patterns. In spite of these indicators, the SPIS is not being fully utilized. The hectarage under rice cultivation (see Table 5), is far below the scheme's capacity of 22 hectares. The highest hectarage cultivated (5.6 ha) was in the 1978/79 season. This was only 25.45% of the scheme's total capacity. It can be deduced that output per hectare has been decreasing at an average rate of 5.30% in the seven year period from the 1976/77 to 1982/83 seasons. Table 7 shows the output per hectare during this period. The figures are deduced from Table 5.

The limited use of the scheme's possible cultivable hectarage, and the decline in output per hectare, can be explained by the following reasons :-

1. Though the cropping pattern can allow double cultivation, rice is grown only in the rainy season (November to March);

2. The cultivation of rice in the rainy season conflicts with the cultivation of other crops like bulrush millet and sorghum (the staple food crops), and cotton (which is heavily promoted by Lint Company of Zambia);

3. The poor drainage in the scheme has resulted in saltification of the arid soils.

<u>RECOMMENDATION</u> : In the prevailing circumstances, double cropping of rice per season does not look feasible. It can be suggested that the scheme's efforts in rice cultivation should be concentrated only in the dry season. This will avoid the conflict in crop production with other crops. But this will only be possible if the drainage system could be improved, so as to control salinity of the soils.

As far as rural income generation is concerned, rice cultivation has been quite stimulative. Table 8 shows the recorded revenue sales of rice from 1976 to 1980. From this Table it is clear that the producer price of rice was almost static during this period. Though we cannot, at the moment, present statistical indicators, the costs of rice production rose during this time. This should also be seen as one of the factors which acted as a great disincentive to the cultivation of the crop

e.4.2 <u>Vegetable Production</u> is the second major agricultural activity at Siatwiinda. They are grown mainly after the harvest of the rainy season crop, rice. Table 9 shows the trends in vegetable marketing in the period 1976 to 1982.

The response of farmers to vegetable production is quite encouraging. From 1977 to 1978, vegetables sold almost doubled, but remained static between 1978 and 1979. Sales then increased by 26.22% from 1979 to 1980. In 1981 they had reached their highest peak of 58,280 kilograms.

The static position between 1978 and 1979 could be due to the mechanical problems of the water pumping engine : this was replaced during the course of 1979, and the sales increased in 1980. The 54.75% drop in vegetable sales from 1981 to 1982 has caused a great deal of concern, to the farmers as well as to the project officers.

In 1972 the Brandt report had pointed out that the local community, including the mining town of Maamba, would not manage to absorb the vegetables which could be produced from a scheme like Siatwiinda. But through the operations of ZAMHORT, a company which used to buy horticultural products from farmers for sale in the urban areas, the scheme was encouraged to grow more vegetables.

The production of vegetables was constrained in 1980 when the government decided to withdraw the marketing services provided by ZAMHORT. Marketing problems then appeared because farmers could neither manage to organise a reliable market, nor arrange regular transport to take produce to the plateau and along the railway line. Thus the drop in marketed vegetable produce in 1982 could have been caused by a combination of three major factors :-

1. Reduction of production by the farmers, as a result of the past year's experience of not finding a reliable market;

2. Flooding of the market by other producers; or

3. Overstretching of the scheme's resources in terms of manpower and machinery, due to the drought situation.

ASSESSMENT : In periods of reliable water supply, ready markets and regular transport of produce to the plateau, vegetables have played a very significant role in the generation of incomes to those involved in production and distribution (see Table 9 on revenues).

It would be interesting to have a nutrition survey which would study the impact of vegetable production at Siatwiinda on the local community. But it can be safely assumed that since the absolute number (see Table 3) and proportional (see Table 4) number of women involved in the scheme is increasing, then some of the produce is certainly consumed in their households. The marketing problems that have been experienced in the past few years can also have a beneficial effect on the local supply of vegetables. Farmers begin identifying themselves with the local market. But when an external marketing arrangement is assured, with a favourable price, then most of the produce will leave the valley, and the impact on the improvement of the nutrition standards of the local community is likely to be very limited.

RECOMMENDATION : The promotion and expansion of vegetable production at Siatwiinda should be taken very cautiously. The local vegetable market cannot be expected to expand in the foreseeable future. This is a very competitive farming activity : it is more beneficial to those producers nearer the main market (the urban areas); and some local consumers now produce their own vegetables in their backyard gardens. For all these reasons the production of vegetables should be discouraged. At the same time it can also be suggested that the size of the vegetable plots should be reduced, so that the number of producers is increased and the base of participation is increased. Individual/household production outside the scheme should also be encouraged, using the scheme as a demonstration plot. This is likely to have an impact on nutrition requirements.

If the recommendation on rice (p.14) is accepted, then the production of vegetables at the scheme can be reduced in favour of rice, since vegetables are mostly grown in the dry season, anyway.

e.5 Scheme Extension and Consolidation : As already pointed out in the section on hectarage and field lay-out (p.10), the scheme has a provision for further extension of 80 to 100 hectares. In 1980, the first phase of the extension, to reclaim 10 hectares which used to be subject to seasonal inundation, was begun with the construction of a dyke. In 1981/82 the second phase to extend the scheme by 30 hectares was embarked upon, and is still in progress. And the third phase, which will require the extension of the scheme by a further 40 hectares, has been planned for the 1984/85 financial year.

The perceived need for the extension of the scheme follows from the belief that a suitable crop for the area has been found. Rice has proved to be the most appropriate crop. The farmers' response has been quite encouraging, and there has been a growing list of people willing to join the scheme. And the local community is developing a taste for rice eating.

But the decision to extend the scheme without first considering a consolidation stage is questionable. Before extending the scheme, it might have been better to assess the management capacity of the Farmers Executive Committee first, on the existing plot. If it is weak, then ways of improving it should have been sought. An inventory of all the resources (including the quality of the soils and the water), manpower and machinery used during the pilot stage, should have been carried out so as to identify areas which needed improvement or replacement. The issue of cropping patterns (as between rice and traditional food crops [sorghum, bulrush millet and local maize, kaile]), should also have been considered. Only then could the extension of the scheme have been properly planned.

I am in favour of the consolidation programme presented by the Gwembe IRDP Coordinator in his 1984 Budget estimate. The scheme has reached a stage where it can no longer continue to be a pilot scheme anymore. A phase of operation should start.

1.2 Buleya Malima Pilot Irrigation Scheme

a) History : The Buleya Malima Pilot Irrigation Scheme (BMPIS) is one of the schemes which were conceived during the resettlement period, to compensate the relocatees for the loss of land caused by the formation Lake Kariba. It was to be considered a pilot scheme, in that information was still needed which would enable the planners to recommend the most feasible crop for the area from a climatic, economic and social point of view, as well as to assess the peoples' adoption of irrigation cultivation methods.

Three different irrigation systems were envisaged :-

1. Damming of the Nangombe River, which would enable the irrigation of 607.05 hectares under gravitational force;
2. The establishment of a large permanent pumping station with a reticulation of pipes and canals which would allow irrigation of a further 3440 hectares; and
3. The utilization of the Lake Kariba drawdown area resources with the use of portable pumping sets. Under this system the irrigation of 1618.8 hectares was seen to be possible.

The implementation of BMPIS was to be in three distinct phases. Phase one was to be considered as a trial period in which the three irrigation methods (above) could be tried on various kinds of crops. This exercise (which was to be conducted on a hectarage stretching over 26.8 ha.), was to last for a period of one to two years. Thereafter the trial activities were to be taken over by the Research Branch of the Department of Agriculture.

In the second phase, the site was to be extended by a further 80 ha., where the relocatees would be settled on irrigated plots.

And the third phase was to be a period of consolidation when the experiences gained in the first two phases would be gathered and utilized. The area under cultivation was to be extended to reach a maximum of 5600 hectares.

b) Hectarage and Field Lay-Out : Although the development plans gave very ambitious irrigable hectarages (7,700 by Roberts, Mullins and Barnett [1961], and 14,000 by the Ministry of Rural Development [1969]) the actual field under the scheme is only 62 hectares. Out of this, 7 hectares is used as a government orchard; therefore only 55 hectares is actually under cultivation by the relocatees.

Initially the plot sizes were a hectare each, with three sub-divisions - 0.2 ha. was to be used for vegetables and fruits; 0.4 ha. for the cultivation of cotton, sunflower or beans; and the other 0.4 ha. for green maize production. In 1980 the plot sizes were reduced to 0.2 ha. This was seen as the most feasible size at the level of the farmers' cropping pattern and irrigation farming expertise. It was also a way of increasing the number of participants.

c) Management : Though the feasibility studies on the BMPIS were conducted in the early 60s, it was only in 1970 that the actual physical work was initiated under the Projects Division of the then Ministry of Rural Development (now the Ministry of Agriculture and Water Development). In mid-1977 the Projects Division withdrew its services from the scheme, and it came under the direct supervision of the Department of Agriculture. Because of GSDP's involvement with other schemes in the area (Siatwiinda and Mkandabwe), the Department of Agriculture requested it to provide occasional mechanical assistance in the maintenance and repair of the scheme's machinery.

In 1979 it was proposed at the ministerial level that GSDP should also assist the farmers in the management of the scheme. In 1980 a GSDP Agricultural Adviser under the Gossiner Mission Assistance Programme was assigned to BMPIS, as well as to the whole of Chief Sinazongwe's area.

The running of the scheme is under a close cooperation of three parties :-

1. The Farmers Executive Committee;
2. The Department of Agriculture, through its extension officer assigned to the scheme; and
3. The GSDP, through the Agricultural Officer assigned to the scheme.

The Farmers Executive Committee deals with the farmers' affairs (in terms of plot allocation and dislocation, scheme discipline and scheme maintenance), and it also acts as a link between the farmers and other related or external institutions.

The Department of Agriculture, through the extension officer, provides technical assistance to the farmers, and it also manages the government's orchard plot. The GSDP officer provides professional advice, both technical and managerial, to the farmers, as well as to the Department of Agriculture.

FINANCE : Unlike the Siatwiinda scheme, which has received some funds from other external sources, through the auspices of GSDP, the Buleya Malima scheme has received all its capital financing from the Zambian government. Table 10 shows the estimated and actual investments in Buleya Malima in the period 1970 to 1979.

d) Farmer Involvement : Unlike Siatwiinda, where plots are allocated to individuals, at Buleya Malima plots are allocated to households. In the first and second phase of the scheme, twelve (12) families were involved. But because of the management changes that the scheme has gone through (firstly, the Projects Division; secondly, the Department of Agriculture; and now the GSDP), it has not been possible to come up with statistical data which could allow an assessment of farmer/household involvement over a period of time. Nevertheless, it has been possible, in some cases, to find out the number of people enlisted in the production and marketing of particular crops [refer to the section on crops, below].

Again, since plots are allocated to households rather than individuals, it has not been possible to make an assessment of women involvement as sole plot holders, though many can be seen working in the gardens. However, a women's club, with a membership of thirteen (13) women, has a plot in the scheme [see the section on Community Development, p.30, for the impact of this club on the area].

e) Crop Production : From the crop production trials, in the first phase, a crop rotation pattern consisting of cotton and sunflower in the rainy season, with vegetables and green maize in the cool dry season, was adopted.

e.1 Cotton : Production in Gwembe Valley is heavily promoted by LINT Company of Zambia (LINTCO). Every agricultural season, LINTCO posts an officer at the scheme to process loan applications, sell requisites and tools, and handle the cotton intake. Table 11 provides statistical data on cotton production at Buleya Malima in the period from 1976/77 to 1980/81. This Table clearly shows that from the 1976/77 to 1979/80 agricultural seasons, the hectarage and the yield of cotton was increasing, though there have been some fluctuations in the intensity of output per hectare. In 1976/77, the average output per hectare was 1,303.81 kgs; in 1977/78, it was 674.78 kgs; in 1978/79, it was 1,755.04 kgs, which was the highest recorded ever; and then it started decreasing. In 1979/80, the average output was 1,649.62 kgs; and in 1980/81, it was 1,204.25 kgs. The drought situation which has beset the southern African region in the past two years, is being given, by the officers attached to the scheme, as the main cause of this phenomenon.

From my assessment, it seems that the problem is more economic and technological than a matter of rain availability. The scheme gets its water supply from Lake Kariba, but because of the frequent breakdown of the engines it has not been possible to maintain a steady supply of water to the scheme. The training of farmers, once enlisted, is also of major importance. But it seems the training is not seen as an on-going scheme activity.

e.2 Sunflower : is also produced at Buleya Malima, but on a very limited scale. Table 12 shows sunflower production statistics between 1978/79 and 1980/81 seasons. The relatively low involvement of farmers in sunflower cultivation, as compared with cotton, is probably the result of the attractive facilities provided in the cotton package. The cotton programme has its own specialized extension officers and LINTCO provides seasonal loans, under very favourable conditions. The payment to farmers is also not cumbersome. Sunflower cultivation is being propagated by the Department of Agriculture, like any other crop. It is not a priority crop in the area, though it is possible for an individual/household to negotiate for a seasonal loan from AFC.

The decrease in the average yield per hectare should be a matter of concern. The technological and economic factors already mentioned in the section on cotton also apply here. Water availability and training of farmers are the major issues.

e.3 Vegetable Production : Just as at Siatwiinda, vegetable production at Buleya Malima is concentrated in the cool dry season - that is, after the harvest of the rain-fed crop. The main vegetables grown are cabbages, tomatoes, rape, okra and green maize. Due to the management changes, frequent staff transfers and the low attention paid to the drawing and upkeep of clear and concise records, it has not been possible to derive any statistical data on vegetable production. Unlike cotton and sunflower, which have centralized marketing arrangements, vegetables are sold on the open market. The producer looks for his/her own market, and he/she is not compelled to submit marketing reports to the Scheme Adviser, nor to the Farmers Executive Committees.

The location of the scheme (18 kms from Sinazeze, off the Maamba-Batoka road), and the distance to the potential market (the plateaus along the railway line), and also the withdrawal of ZAMHORT operations in 1980, have all severely constrained the optimum utilization of the scheme's capacity to produce vegetables.

It has not been possible to assess the impact of vegetable production on rural income generation and the improvement of villagers' nutritional standards : there are no long-term statistical data which could indicate the number of households involved in vegetable production each season, and also the absorptive capacity of the surrounding community of the produce from the scheme. But it can safely be assumed that, despite the marketing bottlenecks, those involved in vegetable production have to some extent benefitted. Problems encountered in transporting the produce to the railway line have also assisted in keeping the produce in the area.

RECOMMENDATION : refer to SPIS section on vegetables, p.15 above.

f) Water Distribution : The scheme gets its water supply from the Lake Kariba. A diesel engine pump is used to distribute it. Though there is a reservoir, the water is now being supplied straight from the source (Lake) to the plots. This makes the fields very vulnerable to water shortages whenever there is an engine breakdown (see the section on the workshop on the logistics of machine repair, p.36). The reservoir is not being used because its soil structure allows a great deal of seepage.

Apart from the marketing constraints, the water supply should be seen as one of the major factors that has contributed to the lowering of the farmers' confidence in the scheme. The morale can be restored only if there could be a reliable water supply system, with a well planned time schedule. This will require the use of the reservoir. The seepage problem needs to be looked into seriously.

g) Conflict in Land Use : The problem of conflict in land use between livestock rearing and crop production is one of major importance in any strategy for agricultural development in the Gwembe Valley. The area has a very strong tradition of animal rearing [see section on livestock p.28 below]. The problem that the promotion of crop production, without livestock consideration, entails is well exemplified at Buleya Malima.

Apart from the use of oxen in land preparation, the scheme has no livestock development component. Since most of the land is being devoted to cotton production, through LINTCO's efforts, the problem of deprivation of grazing fields becomes very acute indeed. According to the local custom, the onus of protecting the fields from livestock wandering does not fall on the owner of the animals, but on the cultivator.

Though the scheme has a fence around it, at times animals find their way into the scheme, and in the absence of plot holders crops are destroyed.

The security of the scheme is, at the moment, in the hands of the Department of Agriculture, mainly because of the citrus tree plot it has in the scheme. But because the plot holders depend on the scheme for much of their livelihood, they should take over most of the functions on their part of the scheme. This should include the security of the scheme. The Farmers Executive can form a security subcommittee which could look into this issue.

1.3 Mkandabwe Irrigation Scheme

a) History : During the resettlement period, a few small dams were constructed on some of the perennial streams. These dams were to create reservoirs for livestock water needs, and also to provide water for crop production in irrigation schemes. As pointed out earlier [p.10], it is very difficult to find out the actual number and location of some of these dams, as most of them have since silted. The

Nkandabwe dam is the only one which is still in use.

Had it not been for the GSDP, this scheme could have faced the same fate as the others. The GSDP came to be involved in this scheme in 1972. It carried out major repairs to the dam and the irrigation field water distribution channels. A year later, in 1973, the scheme had been revived, and some local farmers came to take up plots.

b) Hectarage and Field Lay-Out : The total hectarage of the scheme is 6 hectares. There are 46 plots of 0.1 ha. each. Plots are allocated to interested farmers.

Unlike the other two schemes (Siatwiinda and Buleya Malima), the Nkandabwe Irrigation Scheme is under gravity irrigation, though the need arises in the late dry season, especially during the drought periods, for an engine pump. Water is drawn from the Nkandabwe River.

c) Management : Since the Nkandabwe scheme is under gravity irrigation, there has not been much need for external institutional support. The only assistance needed is that of technical advice in infrastructural facility development, crop production (training), and disposal of produce (marketing).

To all intents and purposes, the scheme is run by the Farmers Executive Committee (FEC). An extension officer for Nkandabwe Agriculture Camp provides technical advice. A GSDP agricultural officer responsible for Buleya Malima also provides occasional advice to the FEC.

The FEC allocates plots, ensures scheme discipline, takes care of the maintenance of the scheme, and collects water fees which are ploughed back in infrastructural improvement.

Apart from the costs borne by GSDP in the improvement of the scheme in the 1972/73 period, there has not been much investment since. The costs to the government and GSDP are only technical (the AA and the GSDP officers' advice). However, the experience of the prevalent drought situation has revealed the need for a standby engine pump. The water level in the reservoir, as of this year, has gone below the scheme's water intake channel. Thus there is a need to pump water. To alleviate the situation the GSDP is making efforts to install a pump at the scheme.

cont./ d)

d) Farmer Involvement : It has not been possible to find out the actual number of farmers involved in the scheme before the GSDP revived it. After all the repairs had been done in 1972, 44 farmers and a nearby primary school took up plots.

The number of farmers has been static at 44 since 1973, because both the total hectarage (5.6 ha.) of the scheme and the number of plots (44) is limited.

As in Buleya Malima (BM) the plots are allocated to households, in the name of the man; there being no evidence of any plot under the ownership of a woman. But it was seen that plots were mainly maintained by women.

In infrastructural improvement work men and women work together. Men do the digging of the reservoirs and canals, and women clean the trenches and canals.

e) Crop Production : The main crops grown at the scheme are green maize and vegetables (tomatoes, onions, rape, okra, egg plants, etc.). In the 1980/81 season 4 x 80 kg. bags of rice were also sold from the scheme. The cropping pattern is that the cereals (maize and rice) are grown during the rainy season, and the vegetables (including some green maize) are grown mainly in the dry season.

From this cropping pattern it can be deduced that the irrigation facilities provided are not fully utilized during the rainy season. It was only in the 1980/81 season that supplementary irrigation was done to enable the growing of rice. This could be the result of the conflict in time and labour allocation between the irrigation scheme requirements and the dryland field activities (where the traditional food crops are grown). [See the chapter on Dryland Farming Programme, p.25].

f) Marketing of Produce : The marketing of cereals like maize and rice finds a ready market in the area; there are very few people involved in the cultivation of these crops, because the environmental conditions are not favourable to the varieties (especially SR52 maize variety) being propagated by the Department of Agriculture.

The ZAMHORT effect, as seen in other schemes (pp.14 and 19), is also felt at Nkandabwe. But the vegetable marketing problems being experienced at Nkandabwe are having an income generation spreading effect on the area. Some people who are not involved in the scheme as producers become involved as traders. They buy the produce from the scheme and sell to passing motorists and bus passengers. These people provide a ready market for the produce. They lift the risk burden of perishables from the producers, and they also give them enough time to concentrate on their work at the scheme.

The impact of the scheme on the nutrition standards of the local community requires a survey, but it can be assumed that since there are more people involved in the scheme's activities, in production and marketing, there should be some positive effects.

1.4 Hand Pump Irrigation Programme

a) History : In 1973 GSDP embarked on a 'hand pump irrigation programme' in the area. But most of the efforts were concentrated in the Kafwambila area, which is quite remote. The initial response from farmers was quite encouraging, but GSDP failed to provide the necessary logistical support, as the Zimbabwean wars of liberation escalated and the area became more of a battlefield.

Access to Kafwambila is very difficult. The roads are in bad condition; most of the bridges have been washed away, and some have deteriorated due to lack of maintenance. Efforts to have the roads improved are being hampered by the fear of landmines, as one of the government graders was blown up.

Some farmers in the Sinazeze area also took part in this programme, but they were very few in number.

b) Hectarage and Field Lay-Out : The hand pumps were used on the farmers' own gardens, especially those along the river. The recommended plot size under this system was 0.05 ha. per pump. Information available indicates that the total hectarage under this programme was 0.75 ha. Kafwambila had 0.6 hectares and Sinazeze had 0.15 hectares.

c) The management of this programme was easy, since the pumps were used in the farmers' own gardens. Thus there were few organisational problems. The pumps were given on a loan basis; farmers were supposed to pay a K10 deposit when collecting the pump. A GSDP Agriculturalist provided the technical and professional advice, going out to visit the farmers. His transportation costs were borne by the GSDP.

Apart from the security situation, the expansion and continuation of the hand pump programme was hampered by the fact that it relied heavily on the GSDP Agriculturalist alone. When his contract expired there was no one to continue his work.

d) Farmer Involvement : In the Kafwambila area, the programme started with twelve (12) farmers, and in Sinazeze with only three (3) farmers. More farmers could have received the pumps, but they have not been mentioned in the GSDP reports. There is no indication in the reports of the actual number of hand pumps bought and distributed to farmers.

Though these pumps could have been given to men, they should be seen as household properties, since they were mainly used on vegetable gardens. But we cannot deny the fact that to repay the loan the pumps had to be used for the production of a cash crop.

f) ASSESSMENT : Without statistical indicators it is difficult to assess this programme's impact on household incomes and nutrition. Moreover, such an exercise could not in any case be very revealing, since the programme was conducted for only one season [1972/73]. But since these pumps are simple to operate, do not need fuel, are portable and not very costly, their impact on the area could have been quite considerable.

To reduce the costs of a motorized officer visiting each and every farmer, the local extension officers should have been used right from the beginning. Before the pumps were distributed, the farmers should have been taken to Malima Farmers Training Centre for an intensive training in hand pump irrigation techniques. Women should also have been involved in this, since it is usually they who work on vegetable gardens.

1.5 Drawdown Irrigation (Silili Cultivation)

a) History : The feasibility studies by Barnett et al. [1961] of the irrigation possibilities in the Gwembe Valley, pointed to the need to look into the potentials of the Lake Kariba drawdown area. Thayer Scudder has elaborated on this [Scudder, 1972] and has recently provided some suggestions on the utilization of this resource [Scudder, 1982]. The Food and Agriculture Organization established, in 1980, an agronomic research trial at Chiabi to look into the cropping pattern of this system. [This scheme is outside the purview of this report.]

Early this year, 1983, GSDP has started a hand-pump (silili cultivation) programme in the area. This programme is mainly concentrated in Chief Sinazongwe's area. Some of the participants are at Chiabi, at an area almost adjacent to the FAO Research Plot, and in some area along some of the rivers.

b) Hectarage : The assessment of the actual hectarage used under this system could not be made, for a number of reasons :-

1. the programme has only just been initiated;
2. the lake is still receding;
3. most of the rivers are dry (not possible to determine their normal levels); and
4. there is no coordination between the lake level regulating agency [CAPCO] and the Department of Agriculture.

The Soil Survey Unit of the Ministry of Agriculture and Water Development is currently working in the area. It is hoped that they are liaising with CAPCO. However, since the farmers are using hand-pumps which are actually suitable for the system, considering their portability, the plot size per pump/user should be limited to 0.05 ha. This will enable intensive cultivation and enlargement of the number of participating farmers.

c) Management : Like the hand-pump programme, the drawdown (silili cultivation) irrigation system presents no complicated management problems. It is also practised on the farmers' own plots.

Silili gardening, following the drawdown of the rivers (and now even the lake), is a long-evolved agricultural activity of the Gwembe community. It used to be practised along the shores of the Zambezi River, before the lake's formation [Scudder, 1962, p.51].

The system seems to have combined well with the use of hand pumps for drawing water (instead of using buckets), when watering the crops. The GSDP provides a hand-pump on loan to the farmers interested in joining the scheme. The GSDP Sinazongwe area agriculturalist provides training in the use and maintenance of the pumps.

d) Farmer Involvement : So far, only seven (7) farmers are involved in this scheme. But there is an encouraging response if one looks at the number of people requesting to be enlisted. In spite of the portability and easy operation of the pumps, none of the seven farmers in the scheme is a woman. But this does not mean that women do not use the pumps once acquired by their husbands.

e) Crop Production : In the tradition of the Gwembe community the Silili system of cultivation used to be used for the growing of the local maize (kaile) [Scudder, 1962, p.30], and some vegetables. But in the GSDP programme, especially at Chiabi, rice production is being attempted. Since the programme has just been started, the hectarage being used is still expanding (as the lake is still receding), it has not been possible to estimate the yield.

f) ASSESSMENT : Though the scheme seems to be socially feasible, it relies too much on the personal involvement of the Sinazongwe area GSDP agriculturalist. It seems that an attempt has not been made to involve the local extension officers. This should have been done right from the start, whenever a farmer is recruited (or preferably, the extension officer should recruit the farmers). This would greatly reduce the reliance on an officer stationed some way away, and his transport costs.

The personal involvement of the Sinazongwe area agriculturalist has also affected the geographical location of the scheme. Since this officer works only in Chief Sinazongwe's area, he has not extended this scheme to Chief Mwemba's area. It can be suggested that, since the hand-pump programme has already been introduced in Chief Mwemba's area, this scheme should also have been extended there. The capacity of the responsible officer could be spread if the local extension officers were involved. This argument can be reinforced by the fact that the south-end of Chief Mwemba's area is greatly deprived : this is the area which has been worst hit by the drought. It should be designated a high priority area.

2. Dryland Farming Programme

a) History : Though the GSDP has been mainly concerned with irrigation schemes, it has also had from the beginning a dryland farming component. But its activities in this field are limited. As already discussed, the Third National Development Plan did reinforce the GSDP role in irrigation activities. But over the years the project officers and observers [Buntzel (1980) and Scudder et al. (1982)], have noted the contradictions between irrigation and dryland farming. Buntzel (1980, p.8) questioned whether emphasis on irrigation was the right approach for the development of agriculture in the Gwembe Valley.

Dryland farming activities have mainly been conducted in Chief Mwemba's area. This is due to the fact that GSDP activities were initially mainly concentrated in this area : since this programme was carried out in conjunction with the rural works programme, it was therefore more relevant in the areas where the infrastructure (roads and bridges) was being improved.

b) Hectarage and Field Lay-Out : The plot sizes in this programme are of one hectare each : one half of it under cotton and the other under maize cultivation. The programme is being conducted on the farmers' own fields.

c) Management : The GSDP agriculturalists together with the local extension officer visit farmers, in the villages, to teach the LIMA concept. The courses are on various agricultural activities; land preparation, planting, weeding, harvesting, crop rotation, erosion control, animal husbandry, etc. Two villages are visited each week. A follow-up visit is made after eight weeks : thus each village in the programme is visited six (6) times each year. This ensures a full year's practical teaching to each village. This programme was organised in such a way that the participating farmers get employed by the GSDP for work on road and bridge improvement during the dry season. In the rainy season they go back to work on their own fields. Whilst employed they get their wages partly in kind (in terms of requisites and seed), and partly in cash. When they go back to their own fields the GSDP agriculturalist teaches them agricultural techniques.

Some arguments for the dryland farming programme are :-

- learning by doing;
- learning in their own villages;
- practising in the farmer's own field;
- both men and women participate;
- extension officers appreciate problems pertaining to a particular village; and
- other programmes (nutrition, water development etc.) can be included.

d) Farmer Involvement : When the dryland farming programme was initiated, it was planned that a hundred (100) farmers would be involved in each four year period. In 1973, very little could be done because of the drought situation. When the GSDP was revitalized in 1976, forty (40) farmers were involved in the programme. In 1977, twenty (20) more farmers joined. Assistance to these sixty (60) farmers ceased in 1979. Sixty (60) new farmers were to be enlisted.

Looking at the 1982 GSDP Annual Report and the 1983 Dryland Farming Programme, it becomes clear that the target has shifted from individuals to villages, though the number of participating farmers per village is recorded. The effect of this is that, although the visits to villages could be maintained, the number of participating farmers varies. Whereas the initial plan had more coordination with those involved in the Rural Works Programme, mostly men, the new turn has brought about the involvement of women. In the 1982 period, the project officer reports that 45% of the participants were women.

e) Crop Production : Since the main thrust of this programme is the training of villagers in order to raise their level of competence to that of small scale farmers, it is not possible to present any statistical indicators which could show the participants' response.

Nevertheless, training under this programme is mainly on maize and cotton cultivation, with an emphasis on the latter.

f) ASSESSMENT : If there can be any project component which is going to have a wider and more appropriate impact on the target group - the poor - then it should be the dryland farming programme. But this will require some adjustments to the way in which the project is presently being conducted.

The first priority should be a reduction in the personal involvement of the GSDP agriculturalist, and a greater reliance on the local extension officers. This will require some improvements in the facilities needed to conduct the training courses. It has to be noted that one of the major resources provided by the GSDP officer is transport. The local extension officers are usually immobile. This is one of the major bottlenecks in the agricultural extension service. If a GSDP officer (expatriate) can be paid travel allowance, I do not see any reason why a Zambian extension officer cannot be considered for a bicycle or travel allowance whenever he uses his own bike. These facilities should be part of the programme.

It seems to me that the personal involvement of the GSDP officer, in visiting each and every farmer (now village), is costly in terms of travel; it also deprives other areas of his assistance. His services could be spread over a wider area if he worked closely with the Farmers Training Centre, planning village courses and, of course, making occasional visits to farmers/villages. This view is supported by a number of extension officers interviewed.

Since LINTCO is already supporting the extension service in the promotion of cotton production, and the maize variety being propagated, SR52, is not doing well in the valley, it can be suggested that the dryland programme supported by GSDP should pay more attention to the promotion of sorghum, millet, and the local maize (kaile) - in other words, the local food crops.

3. Rural Works Programme (RWP)

a) For the history and management of this programme, refer to chapter 2 above, on the Dryland Farming Programme.

b) Projects Undertaken : Although the improvement of roads and bridges was the major occupation of the RWP, it was also involved in other construction works. In 1981, the RWP team improved the fencing of the Siatwiinda Pilot Irrigation Scheme, and they were expected to involve themselves in the construction of weirs, dams and wells, erosion control etc. Among the roads that were improved under this programme are the 8 kilometer stretch between Nyanga and Kafwambila, and the Malima-Sinazongwe road.

c) ASSESSMENT : Infrastructure development plays a very important role in rural/agriculture development. The extension service often shuns inaccessible areas. Farmers also face transport problems in bringing their requisites and machinery to their homesteads, and, at the same time, they find it difficult to deliver their produce to the markets. Since the Gwembe South area has only one tarred road, it is necessary to connect areas of agricultural potential to the main road.

The RWP's contribution in terms of income generation and its productive use, remembering that part of the income is in kind (agricultural inputs), is quite remarkable. This is also reinforced by its bias on labour, rather than capital intensive methods.

The major problem with the RWP is that it entrusts the supervision of road and bridge construction to agriculturalists, people with no expertise in this field. Even with good intentions, these officers cannot fully exercise their talents, time and interest on theor own fields of expertise. And at times, if the work programme is not strictly scheduled, construction work can be stretched even into the agricultural season. Households are then deprived of the man's labour, and a great strain is put on the capacity of women; this in turn affects the household's agricultural activities.

It is because of the factors that I support Buntzel's recommendations that the RWP be handed over to the district council. The council should have enough expertise in infrastructure development; if it hasn't, then measures should be taken to improve its capacity.

4. Livestock

In spite of the importance of livestock in the traditional economy of the Gwembe Valley, the GSDP has not been involved in any significant livestock development programme. The only project tried involved pigs, but it was on a very limited scale. In the dryland farming programme some advice on livestock improvement is given, but it is also limited.

Pig production was introduced in 1978 in Chief Mwemba's area, with three (3) farmers. For easy access to credits, the programme was established in areas where credit unions existed, though the GSDP assisted in the purchase of feed.

Management : The participating farmers raised the money for the piglets and they had to build the sties. The GSDP provided loans for feed. The Cold Storage Board had agreed to purchase pigs, if there were more than twenty (20) pigs at the time of sale. The main market, however, was seen to be the local community. But towards the end of 1980 it became obvious that the programme could not be continued without a reliable supply of feed. It was therefore discontinued.

ASSESSMENT : It can be said, very strongly, that the pig project was ill conceived. This project should have been designed as a livestock development project aimed at resolving the conflict between crop production and livestock raising. This conflict is of major importance in any discussion of agriculture promotion in this area. The problem of animal wandering in the Buleya Malima Pilot Irrigation Scheme [refer to p.20], is a case in point. With most of the arable land (also good grazing land) going to cotton production, the problem of provision of enough grazing fields becomes very acute indeed.

The problem of land utilization in the Gwembe Valley (as between crop production and livestock raising) should be looked into in depth.

The Scudders/Colson team (1982) offered three options for the improvement of GSDP involvement in the Gwembe Valley livestock industry :-

1. To provide financial assistance to the relevant government departments in order to facilitate their current work, and to encourage them to work more closely with the GSDP;

2. For Government departments to second to the GSDP a livestock officer who would work closely with the GSDP officers; and

3. For the Gossiner Mission to recruit directly to the GSDP a livestock specialist who would work closely with a government counterpart seconded to the GSDP.

They favour the third option, but because of the time that it can take to recruit a suitable candidate, they suggest the implementation of the first option, as a short term measure. I also favour the first option, not as a short term measure but as the most feasible long term solution.

I feel that energy should not be directed from existing institutions to the strengthening of the GSDP, but rather that resources which come through the GSDP should be directed to strengthening and improving the implementation capacities of the relevant existing institutions. In this regard, any livestock development programme considered under the GSDP should be seen in the light of the implementation capacities of the relevant institutions. If the capacity can be improved by the provision of a livestock specialist, and if the Gossiner Mission can provide (through the GSDP) such a person, then he should from the outset work within the existing institutions. This will enable such a person to understand fully the environment in which those particular institutions operate; and it will also help to establish a precedent for the future withdrawal of the GSDP support, once the capacity of the institutions in question has been improved.

5. Community Development Activities

Community development programmes under the GSDP were initially seen as secondary to irrigation activities. But over the years they have had a much wider effect in the Gwembe Valley. The activities have ranged from the usual 'traditional' women's activities, under women's clubs; nutrition programme; self-help projects; village water supply; and so on, - to the establishment of locally based, grassroot institutions. It is the building of local institutions that sets the GSDP apart from other regional development projects in Zambia.

5.1 Women's Activities : The GSDP's involvement in special women's activities started in 1980 with the arrival of a women's activities promotion officer. Three clubs - Lusumpuko, Sinazeze and Buleya Malima - - have been receiving GSDP support in the three year period.

Lusumpuko Women's Club : was established in October 1980 in Chief Mwemba's area, at Siabaswi village. The aims of the club were very attractive. The club was to use the local resources, sisal (out of which the fence of Siatwiinda Irrigation Scheme is made), and water, from Lake Kariba, to make ropes. The local community was identified as the main market.

The rope-making programme was also seen as a way of involving the local women in GSDP activities, and it was to assist in the generation of rural women's incomes. Thirteen (13) women were involved in this club. The club met many economic, social and technological problems. The work involving the cutting of sisal, cleaning (which is a very unpleasant job), and rope making, is very labour demanding. For the project to be attractive the remunerations had to be high. But rope could be imported from Kenya at a far cheaper price than the club would have to charge just to break even, let alone make a modest profit. And the fact that all club members were young unmarried women proved very problematic; those who got married usually left the area, and the club. The rope-making machine was also not appropriate for making the type of rope needed by the local community. It was limited to rope sizes between 6mm. and 12mm; the smaller size proved to be too big for the fishermen's requirements, and the larger was too small to be used on oxen. Thus the ropes could not be put to any productive use, and therefore could not find any ready market. Accordingly, early in 1983 a decision was made to discontinue the sisal/ rope- making programme, and the club turned to the usual women's club activities - knitting, sewing, vegetable growing, etc.

ASSESSMENT The enthusiasm of the participants when the project was started (in spite of the unpleasantness of the sisal cleaning part), shows that women can organise themselves in tackling even jobs once assumed to be too difficult for them, if the right conditions are provided. The problem was not so much with the women as with the project planners. They did not involve elderly and married women, people who are likely to stay much longer in the area. And despite the fact that the club could not control the market, a survey could have been conducted to identify the type of ropes which were likely to find a ready market within the community. If these socio-economic and technological dimensions had been seen in their right perspective, the programme might have survived.

The Sinazeze Nutrition Group : is involved in five clinics. It conducts preventive health programmes and practical cooking lessons in villages. Due to lack of funds, the GSDP involvement in this group has been limited to an occasional advisory role.

The Buleya Malima Pilot Irrigation Scheme Women's Club : poses very interesting questions about the general direction of women's club efforts in rural areas. The club was established in 1981; it has a membership of thirteen (13) women. They all work together in one of the plots at the scheme. The club operates like any other farmer in the scheme. In 1982 the club grew rice and irish potatoes, but due to the water problems the yields were disappointing.

Looking at the backgrounds of club members, one finds that ten (10) of them are wives of government extension officers, two are wives of fisher men, and only one heads a home, as a divorcee. None of the members is an 'ordinary village woman'.

Does this programme really serve the interests of the village woman, at whom it is supposed to be directed? Why is it that village women are not involved? It may be that village women are too occupied with other more important activities. As we have already seen (p.18), plots at Buleya Malima Scheme are given to households, rather than to individuals. Are efforts in designing special women's club activities worthwhile? The Buleya Malima experience suggests that some of the special women's programme activities serve the interests of a rural 'elite'. Drawing on the Siatwiinda experience, where some women have acquired their own plots as individual farmers and not as a group, it could be suggested that efforts to promote women's involvement in GSDP should be directed towards those activities which are of major importance in the improvement of the livelihood of village households.

5.2 Nutrition and Preventive Medicine

As early as 1973, the GSDP has been involved in nutrition and public health programmes. In nutrition, the project started with the Breaktime Food Programme in primary schools. A survey was conducted to find out the proportion of pupils who had breakfast each morning before going to school. It was found that only 35% of the pupils had breakfast. With this information the GSDP started selling milk, biscuits and groundnuts in schools. But this programme could not be maintained, as the prices of these commodities kept on rising; and it was mostly pupils from the relatively well-to-do families who were buying these provisions any way.

The collapse of this breakfast food programme is no surprise. Instead of tackling the root cause of the problem the programme addressed itself to the effects. After finding that 65% of the pupils had no breakfast, the survey could have been extended to try to find out about the food provisions in the pupils' families. The problem may be not so much the supply of food to family members, but rather the conditions for its production. This could explain the nutrition value of the families' food provisions and its distributions.

cont./ 6.

6. Village Water Supply

During the resettlement period (the late 50's and early 60's), a water well digging programme was conducted. In Gwembe South alone, more than 250 water wells were dug, but at the moment less than 50 of them are still in use.

There are some sociological and technological problems associated with the village water supply programme in Gwembe South. It has to be noted that the Gwembe community (mostly women), prefer using and drawing water from the rivers, and not from wells. They consider it better to use running water for washing household goods and for bathing than to use stagnant water, (just as some people prefer a shower to a bath). For home use (drinking and cooking), people argue that river water has a pleasant smell. The implication of this for the water well programme is that, if there is a longer period with reliable rainfall which can keep rivers flowing throughout the year, then people will just abandon and neglect the upkeep of the wells. It is only in times of drought that people will go back to using wells. This brings us to the technological question.

Of course, it is obvious that the relocatees were not consulted when wells were being dug during the resettlement period. We also know that the maintenance of communal facilities, like water wells, poses many problems. Can we, then, expect village communities to maintain a communal well which is not in use for long periods at a time (more than four rainy seasons, for instance)? The GSDP experiences can assist us in answering this question.

Right from the start, GSDP has engaged in the village water supply programme in both sociological and technological dimensions. An education component, under the Female Extension Officer, is being conducted, teaching people the importance of having a clean water supply. The Sinazeze Nutrition Group has been successful in this exercise. Though the digging of wells is being seen as a man's domain, the group members (all are women) know all the different steps of digging wells : how to organise the construction on a self-help basis, and how to approach the District Council for assistance. They usually organise discussions with course participants at the Kalima Farmers Training Centre, in under five clinics, in Rural Health Centres, and in villages. The care that the village communities are putting into the maintenance of the wells that are now being dug, can partly be attributed to this group's efforts.

GSDP reports do not specify the number of wells that it has assisted in digging over the years that it has been involved in this programme. It has often assisted where a self-help spirit has been shown in the digging of the pit. GSDP assists in casing the well. Where problems have been encountered, the project has drawn on the assistance of the District Council (which is, in any case, the institution set up to provide this type of service). The District Council has thus provided assistance to the GSDP to complete its planned projects - instead of the latter supporting the former. As I have suggested in considering other project components, GSDP assistance should be directed to the relevant existing institution : in this case, to the water supply section of the Council.

7. Institutional Building

Unlike other regional development projects in Zambia, GSDP has assisted in setting up locally-based, grassroot institutions. These are the Valley Self-Help Promotion Society, the Gwembe South Builders Cooperative and the Credit Savings Unions.

Though I have, in my assessment of other projects' components, supported the idea of letting existing institutions implement the planned programmes, with GSDP providing assistance, there are certain circumstances which demand the establishment of new institutions. GSDP has found itself in situations where the effective utilization of its resources required special institutions which are outside the normal government arrangement, but receptive to the Gwembe community's sentiments.

Valley Self-Help Promotion Society (VSP) : The Gwembe Valley Self-Help Promotion Society was established in 1979. The GSDP management thought of establishing the VSP to circumvent government bureaucratic requirements in channelling external donations, which it used to receive from time to time. Another reason was that some project activities could be self-supporting (and could therefore generate some income which could be ploughed back for the area's development), but only if they were under a non-government body.

Management : The VSP is registered as a society. It is governed by a general meeting which elects the executive committee. The membership of the general meeting is drawn from the local institutions - such as the traditional chiefs, farmers executive committees, religious groups, credit unions and the local community. The executive committee decides on VSP activities (new and on-going), approves loan applications and employs the secretariat, which is headed by a coordinator.

7.1 Valley Self-Help Promotion Society

VSP is involved in quite a number of activities. It provides loans for a wide variety of purposes - seasonal agricultural loans; home improvement ; and even educational loans to pupils. It was not possible to find out the number of loans, or the total amount of loans in each sector. The maximum amount an individual can be lent is K500.

In its crafts programme, VSP has been involved in the production of axes and in the purchase and collection of village-made crafts. The axes programme is solely for the generation of income for VSP, but the village crafts programme is mainly geared to the promotion income-generating activities in the villages. Every week VSP spends between K200 and K300 on the purchasing of crafts from villages. The crafts are mainly sold in Lusaka at the Tonga Crafts Shop in Kabulonga township. Some of the crafts which are of historical importance are being kept at the Tonga Museum which VSP maintains at GSDP Nkandabwe camp. But the preservation of most of the materials in the museum needs professional handling. Neither VSP nor GSDP can provide this. To lift this burden from VSP, the Department of Cultural Services should run this museum. But the materials themselves should not be transferred elsewhere; since they represent the Gwembe way of life they must be kept in the area.

VSP is also involved in commodity selling. It sells salt and sugar in the villages. In the prevailing drought situation, VSP has assisted in the distribution of foodstuffs to remote areas In times of good harvest and reliable marketing arrangements, VSP purchases agricultural produce from farmers. Since VSP has its own lorry this provides a very big relief to farmers, who find it difficult to make their own personal transport arrangements to bring their produce to the market on the plateau.

Apart from food provisions VSP also sells bicycle spare parts, building materials and second-hand clothes (sent by well-wishers in Europe).

Through its income-generating activities VSP has been able to provide materials that are needed in self-help projects - for example, in the setting up of clinics at Chiabi and Sikaneka, and the Sinazeze Self-Help staff house.

Recently, VSP has embarked on a school uniform tailoring programme. To obtain uniforms people usually travel to Choina : to reduce the costs, VSP has eliminated the need for such travel. Apart from being worn for school purposes, uniforms compel parents to spend some of their income on children's clothing.

For the future, VSP is planning to run a bus service from Kafwambila to Choma. The normal service usually runs along the tarred road from Batoka to Maamba. Transport to remote areas like Siameja is very difficult to come by. The nature of the roads is a major hindrance. VSP has to ensure that the roads are improved before it introduces this service.

ASSESSMENT : It seems that VSP is providing a valuable service to the valley mainly because of its flexibility, and (most importantly) because it is controlled by the local community. But it has to be realised that, at its present capacity, VSP is overstretching itself.

It can now be asked whether VSP can operate independently, without GSDP support. This would require VSP to attempt to operate on a profit margin. This would force it to concentrate only on those activities which can ensure a reasonable income. And this, in turn, would mean a negation of its role as a service unit in the task of building up a self-reliant spirit in the communities. If it is to fulfil this objective, then it cannot, at the same time, be expected to operate at a profit. Therefore, for the foreseeable future, VSP will still need to rely on external (or local) finance and technical assistance. In the long term perspective, VSP will have slowly to disappear, with its functions gradually being taken over by societies or other relevant institutions.

7.2 Gwembe South Builders Cooperative (GSB)

Like the VSP, the Gwembe South Builders Cooperative also evolved from GSDP activities. After renovation of the GSDP Nkandabwe camp in the 1972/73 period, GSDP decided to retain the building team. For flexibility, and to build up the expertise in the building trade, the building team was assisted in forming a cooperative society.

GSDP seconds to GSB a Building Engineer and a Works Supervisor, and it also processes occasional external aid to the society. GSB undertakes most of GSDP's construction works, as well as most government department's capital (construction) projects in the area. It has also undertaken some construction work for the Maamba Mine, and even for the Department of Agriculture in Choma.

Finance : As a society, GSB is supposed to generate its own income. Financial assessment of GSB (and even of VSP) was not possible, because auditors had just been engaged to look into their account books. But the GSB 1982 Annual Report indicates that without GSDP support, GSB could not have survived.

The issue of relevance, as far as this report is concerned, is GSB's involvement in agricultural activities. In conjunction with the GSDP's Rural Works Programme, GSB carried out the infrastructural development work at Siatwiinda, for its extension. GSB also provides agricultural loans to its members. But the actual number of loans given out varies according to the financial position of GSB, as this depends on the number and worth of contracts under GSB.

In avoiding the inappropriate supervision of construction works by agricultural officers (as discussed on the Rural Works Programme section, above, and as experienced in other IRDPs), the system of awarding building contracts to GSB looks feasible. But to avoid drawing male labour from agricultural activities, GSB should handle mostly short-term, small projects which do not require much capital investment, relying rather on human labour. The construction of small bridges, weirs, small dams, etc., are some of the possible projects.

7.3 Self-Help Savings and Credit Unions

The question of rural finance/credit is of major importance whenever new technology is introduced to promote agricultural production in the small scale farming sector. Unlike other IRDP projects in other parts of the country (Luapula and Northern), where the participating farmers have been given subsidies in the form of seed and fertilizers, GSDP has opted to promote local savings and credit unions.

Since GSDP activities were initially concentrated at Siatwiinda, it was also there that the first efforts in savings and credit union promotion began. In the later part of 1977, a study group for the Siatwiinda Savings and Credit Union was formed. The union came to be registered in 1978.

Apart from promoting savings and provision of credits to its members, this union has been involved in other agro-related activities as well. It has been involved in produce marketing (see p.13), rice polishing (see p.13), and its credits are also given for fishing activities and also household (domestic) needs. Table 13 shows the development of Siatwiinda Savings and Credit Union activities in the period from 1977 to June 1983.

It is very interesting to note that (as was observed in the womens' involvement in the irrigation scheme, p.11), the proportion of women members almost doubled in the six year period from 12.5% in 1977, to 24.77% in June 1983. This could be a result of easy access to credits, as the number of agricultural loans and the total amount given out more than doubled from 12 loans amounting to K1034 in 1978, to 31 loans amounting to K2751-60 in 1982.

When this union was formed it was specifically for members of the irrigation scheme, but later this policy was changed. The membership is now open to all people residing in and around Siatwiinda village. Government officers (teachers, extension officers) can also join, but the membership of this group of people is still very low. There were only two (2) out of a membership of 31 in 1977, and only eleven (11) out of a membership of 88 in 1978 [Hassler, 1978].

But this policy of open membership to all sectors of the rural community in the promotion of savings and credit unions has affected their establishment in other areas. At Sinazeze/GSDP Nkandabwe camp a credit union study group was started, mainly through the initiative of GSDP workers and some few farmers and teachers. But efforts to persuade farmers at the nearby Nkandabwe Irrigation Scheme to join, proved futile. It is reported that farmers were "afraid that there [was too] much influence from labourers and teachers".[Hassler, E. p.9]. Thus, in spite of the remarkable development of the Siatwiinda Savings and Credit Union, it is still the only registered union in the area.

Some lessons can be drawn from these experiences. The need for a local institution to provide savings and credit facilities was much appreciated at Siatwiinda scheme, which is relatively more remote and has very few workers in the formal sector. Nkandabwe irrigation scheme, on the other hand, is near an all-weather road and has a much larger concentration of people employed in the formal sector; here the farmers have not only been reluctant to join a union dominated by government workers, but have also failed to develop much cooperative spirit among themselves. Maybe this phenomenon can be attributed to the type of technology in use at the schemes, and also to the nature of the farmers' external contacts.

At Siatwiinda the scheme relies on water pumps for its water requirements - whilst at Nkandabwe, the water is mostly distributed by gravitational force. The marketing of produce at Nkandabwe is more problematic if done collectively by farmers, than when done individually; whereas in Siatwiinda, it is much easier to sell collectively than individually. The distribution of water at Siatwiinda requires a higher spirit of cooperation among participating farmers than at Nkandabwe. These factors maybe played a major role in the appreciation of a locally based and controlled saving and credit institution. Promoters of savings and credit unions should thus be more cautious in areas where the target group does not seem to have a common purpose.

8. Workshop and Intermediate Technology

At Nkandabwe, GSDP maintains a workshop. This workshop acts as a service unit to the project components. Its main activities are camp maintenance irrigation schemes equipment repair and maintenance, and the training of its employees. Occasionally, it has also been involved in the design and introduction of easy, small, 'appropriate' technologies.

In all these activities, the workshop has done a commendable job, considering that the Mechanical Service Branch (which is supposed to carry out government mechanical works) is not effective. But it is my view that the workshop could have done more effective work if it had an extension and training wing.

Though the workshop has been involved in training craftsmen, these have only been its own employees. The workshop has not gone out to train farmers in the repair and maintenance of their equipment. Whenever there is an engine problem at the schemes, the farmers rely on the workshop. It would be preferable for the workshops to include their courses in the Dryland Farming Programme.

Over the years, GSDP has been involved in the introduction and trial of various types of intermediate technologies. These have ranged from simple irrigation pumps, biogas plant, turbine-powered maize mills, and projects in the training programme. But since most of these projects were not designed as long-term GSDP components, and they depended on the personal initiative of promoting officers, they were discontinued with the departure of these officers. These installations now stand as mere monuments.

We can draw some lessons from GSDP experiences. These small, simple projects which have been littered everywhere have been seen by their promoters as 'appropriate'. It has to be realised that, in making this judgement, these people have mostly looked at the machines themselves, but not at how these technologies can be fitted or adapted to the village communities. These technologies have also suffered from lack of institutional support. There does not seem to have been any coordination between the promoters of these technologies and those who supply them. It does not make much sense to introduce a hand-pump if it (and its spare parts) cannot be found in the local (or nearest) shop.

Though these technologies look simple, the costs in personnel, time, and the shattering of peoples' expectations when they are abandoned, are very considerable. Any new technology introduced should be seen in its long-term perspective.

9. CONCLUSION

The activities presented in this report are varied and numerous. This is the case with most of the IRD Programmes, especially where there is a community development programme. It is actually very difficult to draw boundaries on what a project should or should not do.

Considering the fluctuations in capital financing, and also the security situation during the period of Zimbabwean wars of liberation, GSDP has done a commendable job. Its impact on the stimulation of rural incomes for those involved has been quite significant. But it cannot be denied that irrigation agriculture usually caters for a small segment of the rural population. The project could have widened its impact if its dryland farming programme had been much broader, and if it had included some fishing activities. These are some of the areas that are being considered under the IRDP Gwembe 1984/85 programme of work.

10. Footnotes

(1) Central Statistical Office [1975] Census of population and housing - Gwembe District CSO, Lusaka.

(2) Buntzel, p.30.

(3) Buntzel, p.29.

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1. Gwembe Valley, IRDP 1984 Budget Nkandabwe.

F ARTICLES

1. Scudder, T. [1971] 'Gathering Among African Woodland Savannah Cultivators : A Case Study : The Gwembe Tonga', Zambian Papers No.5, University of Zambia, Institute of African Studies.

Table 1. CAPITAL ALLOCATION : 1972 to 1982, showing percentage changes from year to year

YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Capital * Allocation	79,742	65,000	63,250	58,500	59,800	76,500	83,000	103,889	125,400		
% Δ		-18.48	-2.69	-7.5	+2.22	+27.92	+8.49	+25.16	+20.7		

* SOURCE : Buntzel Report p.30

Table 2. S.P.I.S : FINANCIAL FLOW, 1972 to 1980 (in Kwacha)

SOURCE	1972	1973	1974	1975	1976	1977	1978	1979	1980
GRZ *	10,128	4,944	6,550	4,918	3,850	4,500	8,000	16,875	9,200
GM**									13,125
TOTAL									22,325

SOURCE : The Buntzel Report p.30

* Government of the Republic of Zambia

** The Gossiner Mission

Table 3. FARMER INVOLVEMENT IN S.P.I.S. : 1972-1982

SEX	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
MALE							47	46	50	39	50
FEMALE							14	14	16	27	30
TOTAL		36	36	36	44	54	61	60	66	66	80

SOURCE : These figures have been extracted from the project's (GSDP) and the scheme's (SPIS) annual and monthly reports from 1972 to 1982.

Table 4. SEX PROPORTIONAL INVOLVEMENT, 1975 to 1982

SEX	1978	1979	1980	1981	1982
MALE	77.04	76.66	75.75	59.09	62.5
FEMALE	22.95	23.33	24.24	40.90	37.5

SOURCE : These figures are deductions from Table 3. on Farmer Involvement in S.P.I.S.

Table 5. HECTARAGE, YIELDS AND MARKETED RICE. FIGURES FOR 1976/77 to 1982/83

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Hectares	2.5	5.0	5.6	4.0	4.2	2.0	2.3
Yields (x80kg bag)	120	200	320	190	175	40	25
Marketed (x80kg bag)	48	150	254	177	156	none	none

SOURCE : These figures have been extracted from S.P.I.S. Annual and Monthly reports from 1976 to 1983

Table 6. NAMBOARD RICE PURCHASES IN GWEMBE VALLEY : 1975/76 to 1979/80 Marketing Seasons

SEASON	1975/76	1976/77	1977/78	1978/79	1979/80
BAGS (x 80kg)	115	80	88	254	175

SOURCE : Department of Agriculture : Annual Reports from 1975 to 1980, Sinazongwe sub-district

Table 7. RICE OUTPUT PER HECTARE AT S.P.I.S.. from 1976/77 to 1982/83

SEASON	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
YIELD per ha. (80 x kg bag)	48	40	59.14	47.5	41.66	20	10.86

SOURCE : These figures are deduced from Table 5.

Table 8. QUANTITY AND REVENUE FROM RICE SALES - 1976/77 to 1979/80 marketing seasons

MARKETING SEASON	QUANTITY SOLD (kilograms)	PRICE/kg (in Kwacha)	REVENUE (in Kwacha)
1976/77	4,931	.18	887.58
1977/78	11,856	.20	2,371.20
1978/79	21,674	.203	4,416.20
1979/80	14,133	.201	2,850.59

SOURCE : Krisifoe, I. [1981] 'Extension of Siatwiinda Irrigation Scheme', GSDP Internal Memo, April

Table 9. QUANTITY (kg) and REVENUE (Kwacha) from VEGETABLE SALES - 1976 to 1982

YEAR	1977	1978	1979	1980	1981	1982
QUANTITY	14,166	27,981	28,471	35,973	58,280	26,369
REVENUE	5,254.10	19,201.04	10,372.40	12,273.00		

SOURCE : For years 1977 to 1980, from Krisifoe, I.J. [1981] 'GSDP : Extension of the Siatwiinda Irrigation Scheme', Nkandabwe Camp, April.
For years 1981 to 1982, GSDP Annual Reports.

Table 10. ESTIMATED AND ACTUAL CAPITAL INVESTMENTS AT BULEYA MALIMA - 1970 to 1979 (in kwacha)

YEAR	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
ESTIMATE*	89,560	33,950	29,600	28,500	25,000					
ACTUAL**	50,000	70,000	63,000	60,000	65,000	38,000	35,000	70,000		

SOURCES : * Ministry of Rural Development [1969] Buleya Malima Pilot Irrigation Project : Southern Province, Gwembe Valley Land Use Services, Lusaka p.18

** Extracted from the Government of Zambia's Estimate of Revenue and Expenditure Annual Reports during the period under review (1970-77). Printed by the Government Printer, Lusaka.

Table 11. HECTARAGE, YIELD and No. of FARMERS ON COTTON

	1976/77	1977/78	1978/79	1979/80	1980/81
HECTARES	14.40	18.40	25.00	40.00	15.5
YIELD (marketed kg)	18,775	12,416	43,876	65,985	19,224
ENLISTED FARMERS (No.)	29	46	52	34	18

SOURCE : From the scheme's and LINTCO depot reports

Table 12. SUNFLOWER PRODUCTION - 1978/79 to 1980/81

SEASON	1978/79	1979/80	1980/81
HECTARES	11	5.5	3.3
YIELD (marketed kg)	7,268	3,509	1,950
No. of FARMERS	28	13	7
AVERAGE YIELD/Ha.	660.72	638	590.9

SOURCE : Data extracted from scheme reports

Table 13. SIATWIINDA SELF-HELP SAVINGS AND CREDIT UNION

SIATWIINDA SELF-HELP SAVINGS & CREDIT UNION	1977	1978	1979	1980	1981	1982	(June) 1983
1. No. of members	32	88	104	151	190	207	218
2. No. of female members	4	9	17	36	43	48	54
3. Share capital	635.33	3141.66	5159.02	9042.04	10462.33	10029.78	9927.73
4. No. of loans (amount)	-	12 (1034.00)	11 (1297.80)	20 (2216.00)	32 (3015.60)	41 (6251.80)	(6017.10)
5. No. of agr. loans (amount)	-	12 (1034.00)	11 (1298.80)	17 (1966.00)	28 (2759.60)	31 (2751.80)	
6. No. of fishing loans (amount)	-	—	—	2 (150.00)	3 (156.00)	5 (930.00)	
7. No. of domestic loans (amount)	-	—	—	1 (100.00)	1 (100.00)	3 (245.00)	

SOURCE : Data provided by the GSDP Cooperative Officer

APPENDIX 2

African Regional Symposium on Small Holder Irrigation

University of Zimbabwe
Harare, Zimbabwe

Editor: Professor M J Blackie

Published by the Overseas Development Unit of Hydraulics Research Limited, September 1984.

PREFACE

Small holder irrigation schemes are growing in importance in many regions of Africa but relatively few detailed investigations have been undertaken into the particular problems which such schemes face. The Overseas Development Unit of Hydraulics Research, Wallingford, has recognised this deficit and, with its broad background of research in irrigation and water resources development, is seeking to encourage further research and to promote an exchange of information already available. This Symposium has, therefore, been organised by the Unit in collaboration with the University of Zimbabwe to bring together engineers. agriculturalists, scientists, research workers and planners concerned with small holder irrigation in order to facilitate an exchange of their ideas and experiences. Since the subject area spans a large number of disciplines, it is the aim of the Symposium to reflect this multi-disciplinary character.

The programme for the Symposium comprises six invited lectures on general themes together with thirty-three technical papers based on research undertaken in fourteen countries. The aim of the general lectures is to provide an overview of relevant subject areas particularly for the benefit of those from other disciplines. The technical papers consider specific questions related to the design, rehabilitation, management and evaluation of small holder irrigation schemes and the role of the farmer. Although the majority are based on African experience, and in particular central and southern Africa, two examples of work from Asia are also included.

The decision to publish these Proceedings prior to the Symposium was taken to allow a greater number of papers to be presented in the time available. The formal presentation of each paper will be relatively brief and, in addition, a number of papers have been included which will not be formally presented but which are included for discussion. Unfortunately, prepublication prevents the details of the Symposium deliberations from being recorded in this volume.

The technical papers have been edited by Professor M J Blackie. In a number of cases this has entailed considerable alterations to the authors' original drafts either to improve their clarity of presentation or reduce their length. However, care has been taken to avoid making substantial changes to the technical content of the papers or to their principal conclusions.

A CONSIDERATION OF THE CONSOLIDATION STAGE : SIATWIINDA PILOT IRRIGATION SCHEME EXPERIENCES IN GWEMBE VALLEY, ZAMBIA

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SUMMARY

The economic history of most riverine and swampy communities does seem to suggest that perennial crop production is very much entrenched in their social economic fabric. But its potential has largely been underestimated. Thus, the introduction of irrigation technology tends to be seen as a new way of crop production. As such, intervention measures initially tend to be designed as pilot projects, so as to generate enough experience and knowledge before their widespread diffusion.

However, experiences with most community-oriented pilot projects seem to show that if the interventions are not based on the intended beneficiaries' own past experiences, the introduction of new technology tends to exacerbate the production risk of the participants. From the experiences in Gwembe Valley, Zambia, it is argued that irrigation interventions in the small holder farming sector have to be geared to the strengthening of the existing production virtues, as well as the weakening and elimination of the risks.

1. INTRODUCTION

The drought, which has plagued most of the southern African countries in the past three years, will inevitably force most of them to consider the use of cropping patterns which do not solely depend on annual seasonal rainfall. Evidence seems to suggest very strongly that even in the small holder sector, interventions will most often have an irrigation component.

This is not entirely a new way of crop cultivation in this area. Most riverine and swampy (dambo) communities have been practising whole-year cultivation systems for ages (Scudder [1980]). But the development field has underestimated the potential of the traditional irrigation systems and the academic field has also overshadowed it with the attention that has been

been generalised as a typical tropical African traditional land use system. Thus most of the development efforts have been placed on the implementation of large-scale irrigation schemes and these are the ones that have attracted academic interest.

Although large irrigation schemes seem to offer the most feasible option in meeting these countries' food requirements, their side-effects have attracted a lot of criticisms: concentration on cash and exportable products (Barnett, T [1975]); people's resettlement (Chambers, R [1969], Scudder, T [1973]); ecological disturbances (Biswas, A K [1970], Coates, D and Redding-Coates [1981]); spread of diseases (Waddy, B B [1975], Hughes, C C et al [1972]); and that they tend to become big business at the expense of poor farmers (see Franke, L W and Chasin, B H [1980]). This has led to a re-think in their promotion and financing. With the popularising of the "small is beautiful" concept, measures seem to be focused on the establishment of small replicas of big projects[1]. But experiences with pilot projects seem to suggest that if they are not based on the participating farmers' own land use systems, they tend to raise the production risk of the farmers and thus their experiences do not just become unfeasible for replication but also a lot of effort and capital tend to be wasted.

From a conceptualisation of the consolidation stage phenomenon, we study the history and nature of the traditional Gwembe Valley land use system. The experiences of the Siatwiinda Pilot Irrigation Scheme are brought forward. From an analysis of the constraints and prospects that the scheme has imposed and brought respectively on the Gwembe agricultural system, a consideration of the consolidation stage is made. In the end it is concluded that irrigation interventions in the small holder sector have to be geared to the enhancement of the virtues of existing systems and not to the exacerbation of their inherent and introduced weaknesses.

2. CONCEPTUALISATION

The main rationale behind pilot projects is that knowledge and experience to implement a particular ideal is still lacking. So it is often assumed that a pilot phase will offer a chance of developing and accumulating these assets. Thus much attention seems to be focused on the success of the pilot phase and its wider application. The area that has, however, received less attention is what I call the consolidation stage. This should be seen as the stage where the virtues and weaknesses

1. When Tenneco-West, a US agro-industrial firm, was asked by the Sudanese government to assist it in its agricultural development programme by embarking on large-scale schemes, the firm's personnel chose to "start small and learn first" (Freivalds, J [1984] p 29).

that the introduction of the ideal has brought to the existing system, during the pilot phase, are being enhanced and eliminated respectively. It is the contention of this paper that a lack of consideration of this phase explains much of the numbing experiences of the community and rural development programmes, which start from a pilot stage. The experiences at Siatwiinda in Gwembe Valley along the Lake Kariba's Zambian shoreline fits this pattern.

3. HISTORY OF IRRIGATION PRACTICE IN GWEMBE VALLEY

The use of irrigation technology in Gwembe Valley is not a recent phenomenon. The history of the Gwembe Tonga does not provide any indication of there being any massive or tribal immigration before the resettlement associated with the Kariba Dam construction in the late 1950s (Roberts, A [1976] p 56). But it does suggest that agricultural practices were closely tied to the regimes of the Zambezi river and its tributaries (Trapnell, C G and Clothier, J N [1957] p 44). However, like many other tropical African communities, the valley Tonga were not associated with any spectacular hydrological works (Morgan [1969] p 257).

The seasonal character of most tropical agricultural systems, relying mostly on the *seasonal* rainfall, were of major importance to the Gwembe people. But this area is subjected to frequent low rainfalls, which are very unevenly distributed and of low intensity. Crop failure was not an infrequent occurence (Scudder, T [1971] p 10). Unlike the plateau based societies, however, the Gwembe Tonga used to be cushioned from severe hunger by their use of the flood plains of the Zambezi river and its tributaries (ibid, p 10).

Instead of relying on only one crop production system per year, like other areas, they used also to practice a notable extended cultivation and harvesting system. This system was based on seasonal flooding and recession of the local rivers. Most of the flood water used to start receding from March onwards at the end of the rainy season. As the water receded, the Gwembe Tonga used to cultivate their crops on the plains, yearly enriched by the alluvial deposits. The cultivation used to be carried on as far as the river receded. The extent and intensity of cultivation on the Zambezi river tributaries was limited because the flow of most of them was not perennial (Scudder, T [1969]).

The cropping pattern based on these two types of cultivation systems - rainfed and flood recession - meant that the cultivation, harvesting and as such food availability were spread for most of the year. The rainfed crops cultivated in the last quarter of the year (October to December) were ready for harvesting in the second quarter (April to June). The harvesting was then extended in that the crops planted when the floods started receding in April were ready for harvesting from late June. As the floods receded and the cultivation extended, so was the period for harvesting. The last harvest being done as late as November.

This cultivation system did, to a very large extent, offset the severity of the frequent low rainfalls. Other studies on the applicability of the floodland cultivation system, both in Zambia (Fetter, B [1981] p185) and in other parts of Africa (Morgan, W B [1969], Bradley et al [1977] and Gray, R F [1963]), have acknowledged its complexity. It was practised only with a high level understanding of the local agronomy and hydrology.

4. KARIBA DAM RESETTLEMENT PROGRAMME

When the government of the Federation of Rhodesia and Nyasaland decided to go ahead with the construction of the Kariba Dam, which was going to entail the resettlement of some 50 000 people (36 000 in Zambia and 14 000 in Zimbabwe), the Rhodes Livingstone Institute engaged Elizabeth Colson and Thayer Scudder to study the socio-economic and ecological aspects of the area. It was then assumed that the information gathered was not going to be merely stored for the benefit of posterity but also that it could provide a basis for the planning of the resettlement programme (Colson, E [1971] p 7).

Thayer Scudder's book on the ecology of the area was already published in 1962. Its discussion of the Gwembe agrarian system was very detailed. The extent to which this system was integrated into the whole Gwembe socio-economic fabric can be deduced in that Scudder's observations in 1958 were not very far from those of Trapnell and Clothier 25 years earlier (1957).

As the Lake Kariba formed, as a result of the damming of the Zambezi river at Kariba Gorge, the floodplain cultivation based on the Zambezi river became moribund. As part of the compensation to the relocated communities, the Northern Rhodesia government planned some irrigation schemes which were going to make use also of the Lake Kariba waters (Roberts et al [1961]). The Siatwiinda Pilot Irrigation Scheme was one of the schemes conceived under these plans.

5. SIATWIINDA EXPERIENCES

The Siatwiinda Scheme is located at Kanchindu village in Chief Mwemba's area in Sinazongwe sub-district. It was one of the schemes considered by the German Development Institute team (Brandt, H et al [1973]). They recommended that since the type of irrigation scheme envisaged had no precedence in the area and that the crops to be grown had not yet been determined, the scheme had to start as a pilot project. This was seen essential to enabling the generation of enough experience and knowledge,

the Gossner Evangelical Mission of West Germany and the Zambian government as part of the Gwembe South Development Project initiated in 1972. The Gossner Mission has been providing technical assistance personnel while the Zambian government has been providing development funding.

The Siatwiinda Scheme covers an area of 32 hectares but it has a provision for further extension of 80 to 100 hectares. The plots in the scheme are sub-divided into 0,2 hectares each. Excluding the 4 hectares which are under the Department of Agriculture Research Branch and also the space taken by the drainages, canals, paths, etc, the actual field under crop production is only 22 hectares.

The management of the scheme, in terms of plot allocation and dislocation, water distribution and at times marketing arrangements and credit provisions, are all under the Farmers' Executive Committee and other related institutions, such as the local Credit Union.

The experience of the scheme in terms of farmer involvement has been quite encouraging. From only 36 farmers in 1973, the figure has more than doubled to 80 in 1983. This increase has also seen a rise in the proportion of women participants as plot holders. It was only possible to assess female participation from 1978. In the four year period up to 1982, this figure also more than doubled from 14 to 30. (See Table 1).

Table 1: Seasonal Variation in Rice Yield and Farmer Participation 1976-83

Season	1976/7	1977/8	1978/9	1979/80	1980/1	1981/2	1982/3
Rice yield/ha (80 x kg bag)	48	40	59,14	47,5	41,66	20	10,86
Total no of farmers	44	54	61	60	66	66	80
No of female farmers			14	14	16	27	30

Source: Data from the scheme annual reports - 1976 to 1982/83

The cropping pattern that has developed at Siatwiinda is one in which rice cultivation in the rainy season (December to March) rotates with the growing of vegetables in the dry season (April to October/November). The research component of the scheme has also confirmed the adaptivity of rice cultivation to the Gwembe conditions (GSDP "Siatwiinda Research Report from 1972/3 to 1974/5" p 5) and has been accepted as a cereal staple food.

From this basis, it was concluded that the search for a feasible crop had been answered and that the scheme could be extended both in space (to make use of the extension provision) and also in enlarging farmer participation (Krisifoe, I [1981]). This actually meant a change of scheme status from pilot to full operation.

6. CONSOLIDATION : A MISSING LINK

In 1982, the Gwembe South Development Project embarked on the physical extension of the Siatwiinda Scheme. But in 1983, it was being doubted whether it was in order to go ahead with the extension of the scheme without first considering the consolidation of the introduced technologies in the existing system (Schaffer, K - private discussion with the author).

Though the Gossner Mission managed to solicit for capital financing from the EEC - for the physical extension - it seems the socio-economic dimensions of the scheme on the Gwembe economy was not considered. The extension seems to have been entirely based on the crop adaptations (mainly on rice) to the Gwembe environment. Even this was not based on the continued use of the existing plots on the scheme but rather upon making use of the adjacent virgin lands. (From 1979/80 season the yields per hectare were decreasing). (See Table 1).

The 1983 evaluation of the whole project (GSDP) by the author (Banda, M [1983]) uncovered a number of constraints which needed resolution before any extension of the scheme could be considered.

The crucial and most important aspect of the scheme is that which concerns the conflict in resource use, both in time and space. (See Table 2).

Though the cropping pattern that has developed is the one which allows the cultivation of rice in the rainy season, it was observed that its cultivation at this time of the year coincided with the cultivation of sorghum and millet, the traditional food crops, and cotton which is heavily promoted by the LINT Company of Zambia, a parastatal body. This results in overstretching of the participating farmer households' labour and material resources between the upland fields and scheme requirements. This tends to have adverse impacts upon all crops.[2]

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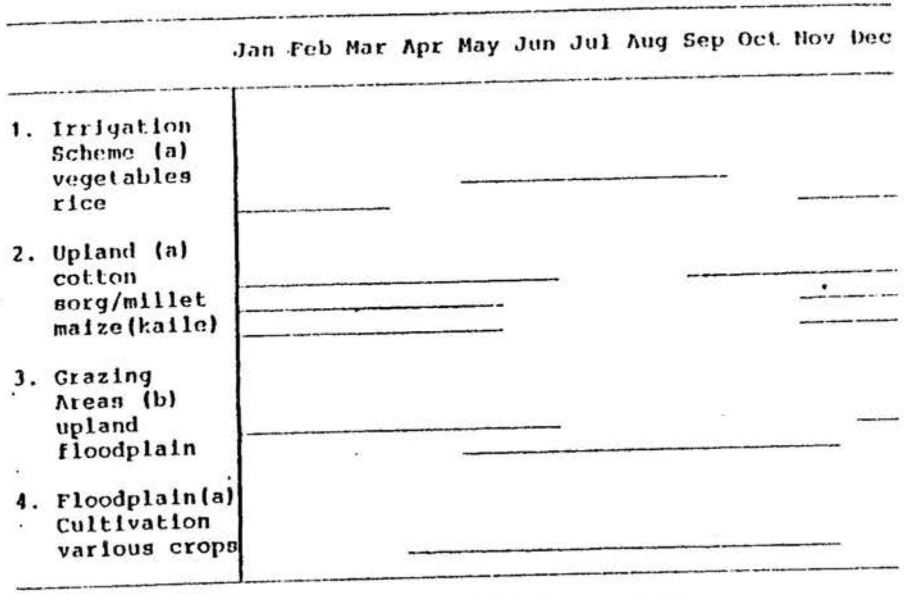
2. It was learnt at Buleya Malima Pilot Irrigation Scheme, also under GSDP, that the low cotton yields, in spite of the adequate chemicals taken on loan from LINTCO, could be partly attributed to the use of the cotton chemicals on other crops, possibly rice in the irrigation scheme. This can also affect the rice yields and consequently cause a danger to the consumers.

Table 2: Distribution of Resource Use in Time



Note: (a) The main cultivation periods
(b) Location of grazing areas

The cultivation of vegetables in the dry season has also suffered a setback. The major problem is in finding an outlet for the produce. The main local market, Maamba Colliery, is unable to absorb all the produce and the marketing channels, provided by ZAMHORT and the Siatwiinda Savings Union, were curtailed when the former was liquidated in 1980. Additionally, the National Savings Union has ruled out the latter by deciding that it should not in any way be involved in income-generating activities. Marketing arrangements, whether individual or collective, have proven problematic in that the distance to the potential market, mainly Choma, is very long; and this market is already saturated by the surrounding farmers.

Thus it has been considered that the cultivation of vegetables at the scheme should be drastically reduced and that a double - rice - cultivation pattern should be introduced. If the conflict between rice cultivation and other crops (sorghum, millet, cotton, etc) is to be resolved, a single rice cultivation in the dry season only was recommended. This means that it has to be accepted that the irrigation facilities of the scheme will not be used throughout the year but be concentrated and intensified only in the dry season. If the taste for rice consumption has really developed, then the harvesting of rice in the second half of the year will serve the same purpose as the floodplain cultivation system of providing foodstuffs at the most food scarcity time of the year, the early rainy season.

The other often ignored land use system is that which integrates crop production and livestock rearing (Kjaerby, R (1983) p 29). As a crop-oriented scheme, it has no livestock component within its confines and it has also tended to disregard the interests of cattle outside it.

For all-year crop cultivation in the scheme, there is not much use in keeping animals within the scheme, apart from ploughing. But the fact that the scheme is based on the banks of the lake, its extension in space means that it is encroaching on areas which offer dry season grazing fields for livestock, when the lake is receding. The potential of the floodplains (or the lake drawdown area) as suitable grazing areas in Gwembe Valley has already been identified (Scudder, T (1980)).

With the existing shortage of grazing land which is accentuated in the rainy season because of the cultivation of both cotton and the food crops on the uplands, and also the flooding of the floodplain, the single cultivation of rice in the dry season could make the scheme a possible rainy season grazing area.

7. CONCLUSION

In this paper, I have attempted to show that, even though the agricultural policies of most African governments will now seem to have an irrigation emphasis, all-year crop cultivation is not a new phenomenon in some of the African societies. The wholesale promotion of irrigation schemes, even in the small holder sector, might alter the existing land use systems and at times even have adverse impacts.

What comes out of this paper is that introduced technologies tend to constrain the allocation of pre-existing resources in rural communities, both in time and space. This is so because their integration into the existing system entails the over-stretching of the already limited resources.

The Siatwiinda experience helps to explain that interventions in the small holder agrarian systems have to be directed to the resolution of the inherent contradictions by integrating appropriately the existing and introduced technologies.

ACKNOWLEDGEMENTS

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APPENDIX 3

ITINERARY OF FIELD TRIP TO ZAMBIA AND ZIMBABWE

Overview of Travel Programme

16 June 1984	: Left Edinburgh for Lusaka.
18 June	: Arrived in Lusaka.
19-21 June	: Left Lusaka for Gwembe Valley to attend Integrated Rural Development Programme Coordinators' Quarterly Meeting.
22 June	: Visited Livingstone for discussions with Provincial Officials.
23-29 June	: In Lusaka : consultations with - Ministry of Agriculture and Water Development (MAWD), National Commission for Development Planning (NCDP) and the Rural Development Studies Bureau of the University of Zambia (RDSB-UNZA).
3-7 July	: Search for historical material in the National Archives.
9-13 July	: At Siavonga (along shores of Lake Kariba) attending an UNZA sponsored workshop on 'IRD with special reference to the Gwembe Valley'. Served as a rapporteur.
16-27 July	: Search for material in National Archives and consultations with MAWD Land Use Branch and Irrigation Section officials.
30 July - 10 August	: Gwembe South revisited; consultations and discussions with project staff and irrigation scheme farmers. Attended an Irrigation Technical Committe Meeting on Siatwiinda Scheme Consolidation.
13-26 August	: In Lusaka; consultations at UNZA, Dept. of Water Affairs, MAWD, Dept. of Town and Country Planning, CAPCO, Agriculture Research Station and Gossner Mission.
27 August - 11 September	: ZIMBABWE - Visit to Banket (predominantly large-scale

farming area) and Mt. Darwin (former tribal trust land).
Consultations at University of Zimbabwe, CAPCO and Dept. of Rural Development - attending and presenting a paper at the Symposium on Smallholder Irrigation.
Visit to Sabi Valley Smallholder Irrigation Schemes.

12-23 Sept. : Lusaka - further consultations at UNZA, MAWD, Agriculture Research Station, National Archives and NCDP.

24 September : Left Lusaka and returned to Edinburgh.

REPORT OF FIELD TRIP TO ZAMBIA AND ZIMBABWE
16th June 1984 to 23rd September 1984 - MOSES BANDA

The field trip was made possible with the travel grant provided by the Institute of Development anthropology of the USA, through the assistance of Prof. Thayer Scudder, of the California Institute of Technology, to whom I am very grateful.

Purpose of the Trip

The main purpose of the trip was to re-visit the Gwembe Valley to look into the irrigation developments in more detail - the first trip being made from March to September of 1983. Another reason for making the trip at this particular time was to enable me to attend an African Regional Symposium on Smallholder Irrigation, taking place in Harare, Zimbabwe, to which I contributed a paper (see item 4 of FUNCTIONS ATTENDED on p.6).

As far as irrigation options were concerned, the questions were mainly based on last year's experience, in which it was discovered that the results of the pilot irrigation schemes were not as successful as expected. The question being asked, therefore, was whether drawdown irrigation based on the Lake Kariba shoreline might be feasible. Since the Gwembe Tonga people were already practising floodplain cultivation before dam construction, this was seen as an opportunity to test whether there could be an integration of this long-evolved technology with the hydrological management of Lake Kariba. Thus, much effort was put into the gathering of information on the following issues :

- the historical basis of the area and the nature of the land use system;
- the extension (hectarages) of the drawdown zones;
- the rates of flooding and recession;
- the identification of geographical features which had some effects on the promotion of drawdown cultivation;
- the nature and use of CAPCO's flood warning system;
- the feasible institutional arrangement needed to foster drawdown cultivation;
- the role of the farmer (e.g. technological capacity to make use of the system).

To find information on these topics the following institutions and individuals were visited and interviewed respectively :

ZAMBIA

1. Ministry of Agriculture and Water Development (MAWD)

   i) Land Use Planning Branch

      Mr. R.S. Mwanza - Chief Land Use Planning Officer

ii) Planning Division

Dr. Osafu - World Bank Irrigation Economist on secondment to MAWD

Dr. Per Eklund - Senior Economist/National IRDP Coordinator

Dr. Mike Warren - US-AID Management Specialist

iii) Mt. Makulu National Agriculture Research Station

Mr. Magai - Acting Senior Soil Surveyor

iv) Dr. Qusam - FAO Irrigation Technical Officer

2. University of Zambia

i) Kafue Basin Research Project

Prof. Howard (Biology Dept.)

ii) Rural Development Studies Bureau

Dr. J. Milimo (Director)

Mr. E. Shula - Public Institutions Specialist

Mr. Phiri Maleka - Agricultural Economist

iii) School of Agriculture

Dr. Ochetim (Dean)

Dr. Patel - Agronomist working on sorghum

3. Department of Water Affairs (MAWD)

Dr. Nyumbu - UN Water Decade Advisor

4. National Archives

5. National Commission for Development Planning

   Mr. J. Lungu - Regional Planner

6. Central African Power Corporation (CAPCO)

   Lusaka Office Liaison Officer

7. Gwembe Valley (Sinazongwe sub-district)

   GSDP Staff

   Collaborating farmers (in schemes)

   District officials

8. Permanent Secretary's Office - Livingstone

   Regional Planner

9. Gossner Mission Liaison Officer - Mr/Mrs Krisifoe

ZIMBABWE

1. University of Zimbabwe - Prof. Murphree

   i) Raul Du Toit - Lake Kariba Researcher

   ii) Prof. M. Blackie

2. CAPCO - Hydrologist

3. Rural Development Authority - Mr. S. Padzakavamba

FUNCTIONS ATTENDED

1. Integrated Rural Development Programmes Coordinators Quarterly Meeting, Gwembe Valley, 19-21 June 1984

2. Integrated Rural Development with Special Reference to the Gwembe Valley Workshop, Siavonga 9-13th July 1984

3. Siatwiinda Irrigation Scheme Technical Committee Meeting, 10th August 1984

4. African Regional Symposium on Smallholder Irrigation, Harare, Zimbabwe, 5th-7th September 1984; published under the same title by Hydraulics Research Limited, Wallingford; edited by Malcolm J. Blackie.
The paper I presented is contained therein entitled 'A consideration of the consolidation stage : Siatwiinda Pilot Irrigation Scheme experiences in Gwembe Valley, Zambia', pp.391-400.

FINDINGS

Material collected from the National Archives reveals that floodplain cultivation, along the Zambesi River was of profound importance in food cultivation, considering that this area is drought prone. However, through the years (1890-1960) the contribution of this system to food provision was constantly being limited by a number of factors, e.g. colonial government neglect of the area; increase of population, which resulted in competition for floodplain cultivation fields; able-bodied manpower emigration; recession and uncontrolled flooding, etc.

Discussions with hydrologists and agronomists in both Zambia and Zimbabwe revealed that a regulated drawdown cultivation system along the shores of Lake Kariba cannot be a foregone conclusion. Moreover, it would require diplomatic arrangement between the two riparian countries, preferably through a regional, resource-oriented development agency like CAPCO.

The only two technical issues which would need considering are the forecasting of the flooding and recession rates, and also the extent of the arable drawdown zones. CAPCO already operates a Flood Warning System and distributes this information to all interested parties. But it has not yet been transmitted to the agriculturalists, who actually produce the crops.

The Soil Survey Unit of the Ministry of Agriculture and Water Development (MAWD) in Zambia undertook a soil survey in Gwembe South last year. But their findings will need to be verified with a detailed assessment of the normal drawdown zones. This can easily be done from the 'Lake Kariba Work Plan' prepared by the consultants who designed the dam and lake site. Dr. Peter Bolton, of Hydraulics Research Limited, has written a thesis on a related topic entitled 'The Regulation of the Zambesi in Mozambique : A Study of the Origins and Impact of the Cabora Bassa Project', (Edinburgh University, 1983). He has offered to assist me, informally, in finding out the extent of the drawdown zones. We have arranged to meet sometime in October.

The workshop organised by the University of Zambia on 'Integrated Rural Development with Special Reference to the Gwembe Valley', offered an opportunity to assess the capability of the existing administrative arrangement in Zambia to implement the drawdown zone irrigation model. After discussions in Harare, with Gwembe District Officials and the CAPCO engineers, it seems the extension branch of the Development of Agriculture could be in a position to promote the model. As such, in the immediate term, there does not seem to be any need to create another institution. But in the long term, CAPCO could be made to widen its focus, so as to be involved with the development of other Lake Kariba Basin resources.

The discussions at the African Regional Symposium on Smallholder Irrigation in Harare revealed that, though there is an appreciation of the adaptive capacity of the small scale farmers to irrigation technology, intervention still takes the form of the introduction of new (or alien) systems, rather than improvement of existing ones. This fact supports my argument that, although some traces of floodplain cultivation have been documented, there does not seem to be any empirical study which attempts to integrate the traditional with the newly introduced technologies. It is therefore hoped that the study will provoke academic interest and practical intervention, not only in the Lake Kariba Basin, but also in other shorelines along man-regulated lakes.

Moses Banda

Edinburgh

1st October 1984